

Historic, Archive Document

Do not assume content reflects current scientific knowledge, policies, or practices.

280.39
R 312

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH ADMINISTRATION
Bureau of Plant Industry, Soils, and Agricultural Engineering
and
WAR FOOD ADMINISTRATION
Food Distribution Administration
[NOT FOR PUBLICATION]

----- 0 -----

MILLING, BAKING, AND CHEMICAL EXPERIMENTS WITH HARD-RED SPRING WHEATS, 1942 CROP

U.S. DEPT. OF AGRICULTURE
LIBRARY
OCT 16 1961
CURRENT STORAGE PROGRAM

----- 0 -----

Beltsville, Md.
September 5, 1943

24
18

THE [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH ADMINISTRATION
Bureau of Plant Industry, Soils, and Agricultural Engineering
and
WAR FOOD ADMINISTRATION
Food Distribution Administration

MILLING, BAKING, AND CHEMICAL EXPERIMENTS WITH HARD RED SPRING WHEATS, 1942 CROP ^{1/}
by

C. C. Fifield, Associate Baking Technologist, and J. A. Clark, Senior Agronomist,
Wheat Investigations, Division of Cereal Crops and Diseases, Bureau of
Plant Industry, Soils, and Agricultural Engineering; Roy Weaver,
J. F. Hayes, B. E. Rothgeb, and T. F. Hertsing, Assistant Grain
Technologists; and E. Hofferker, Associate Grain Technologist,
Grain Products Branch, Food Distribution Administration

CONTENTS	<u>Table</u>	<u>Page</u>
Introduction		1
Source of samples		2
Methods used in the baking tests	1	3
Experimental results		4
Regular methods		4
Plot samples		4
Composites of uniform varieties	2	5
Station tests	3	7
Arizona increases	4	16
Nursery samples		18
Regional nursery composites	5	18
Intra-State nursery composites	6	21
Station tests	7	23
Bromate response methods	8	27
U. S. D. A., Minn., and W. Dak., methods	9	27
Commercial grade samples	10	32
Comparable samples with Thatcher: 1942	11	32
Comparable samples, 1938 to 1942	12	32

INTRODUCTION

Samples of some of the standard varieties and new hybrid strains of hard red spring wheat, grown in cooperative experiments in the spring-wheat region ^{2/} of the United States, are milled each year by the United States Department of Agriculture and the flour baked into bread by a number of different methods to determine their quality characteristics. Three of the regular baking methods used for the 1939, 1940 and 1941 crops were continued for most of the experiments and also bromate response methods as used in the 1941 report were made on a selected group of hard red spring and hard red winter wheats comparatively grown at Sheridan, Wyo.

1/ Cooperative investigations of the Division of Cereal Crops and Diseases, Bureau of Plant Industry, Soils, and Agricultural Engineering, and Grain Products Branch, Food Distribution Administration. The experiments were conducted in the laboratories of the Food Distribution Administration. The samples were obtained from the cooperative experiments with the State Agricultural Experiment Stations in the spring-wheat region.

2/ Clark, J. A. Results of spring wheat varieties grown in cooperative plot and nursery experiments in the spring-wheat region in 1942, with averages for 1929 to 1942. 46 pp. [Unnumb. publication] [Micrographed.] 1943.

The purpose of this report is to make available to cooperators all of the quality data from the 1942 crop obtained from standard varieties, new hybrid strains, and Federal supervision grade samples of hard red spring wheat, together with a summary of previous years' results.

SOURCE OF SAMPLES

The most extensive tests have been made on Eastern and Western composite samples of each of eight uniform varieties grown in plots at 20 cooperating stations. Station samples from plots grown at St. Paul, Waseca, Morris, and Crookston, Minn.; Langdon, and Dickinson, N. Dak.; Brookings and Eureka, S. Dak.; Madison, Wis.; Moccasin and Havre, Mont.; and Sheridan, Wyo.; were tested by the regular methods. Further tests were made on samples of new wheats grown in increase plots from late seeding (from 1941-42 Arizona increases) grown at Langdon and Dickinson, N. Dak. Similar tests were made on eastern and western composites of the 26 strains grown in Uniform Regional Nurseries at 18 stations. In addition, samples from North Dakota Intra-State, Montana Intra-State, and Mandan, Langdon, and Dickinson, N. Dak., and Bozeman, Mont., station nurseries were tested. There were also included seven composite samples from cars of wheat grading No. 3 or better obtained from field offices of the Grain Products Branch, Food Distribution Administration, representing the better grades of hard red spring wheat received at these markets. These were assembled by the official inspectors from car-lots by grade at Minneapolis, Minn., and Great Falls, Mont.

METHODS USED IN THE BAKING TESTS

Baking tests on the 1942 varietal samples were conducted by the straight dough procedure using three of the baking procedures included in testing the 1939, 1940, and 1941 samples, i.e., (No. 2) commercial, (No. 3) commercial-bromate, and (No. 6) commercial-bromate-malted wheat flour. Details of the three methods used this year with the various ingredients are shown in table 1.

The baking procedure used is based on the method of the American Association of Cereal Chemists, with certain modifications deemed necessary for unbleached experimentally milled flour. Because of the size of the mixing bowl, ingredients sufficient for two loaves were mixed at one time. They were mixed a sufficient length of time to properly develop the dough in a Hobart-Swanson dough-mixer (108 R.P.M. with 4 pins in the head and 2 pins in the bowl). The absorption of the flour was determined by adding the proper amount of water at the time the doughs were mixed. The absorption values are indicated in the tables. When mixed, the doughs were divided, then rounded in the hands and placed in fermentation granite-ware "oatmeal" bowls, measuring 6 inches top diameter, 3 inches bottom diameter, and 2-1/2 inches deep. The punches were made by folding the dough approximately 10 times in the hands. At the end of the fermentation period the dough was molded by a Thompson mechanical roll type "A" moulder with rolls set at a clearance of 3/8 of an inch and the compression plate 1-1/8 inches. The molded doughs were placed in baking pans constructed from 2XX tin known as the toll form. A proofing time of 55 minutes at 86°F. and baking time of 25 minutes at 450°F. were the same for all the samples. Two loaves of each

sample were baked but since the ingredients were mixed as for one loaf, the two are not duplicates in the sense in which that term is usually used and are not so considered herein. Data given in the tables are averages of the two loaves.

The basic baking method (No. 1) which has been used on all samples starting with the 1929 crop was discontinued in 1942, as it appeared to add little information not already given by the three baking methods used on the present crop. The commercial method (No. 2) was added in 1935 and in 1936 the commercial-bromate (No. 3). For a part of the samples in 1937, the basic, commercial and commercial-bromate bakes were made. In 1938 the same bakes as reported in 1937 were made and in addition the (No. 4) malt-phosphate-bromate. In 1939, the No. 4 method, which had been found to be unsatisfactory under our conditions, was replaced by the commercial-bromate-malted wheat flour (No. 6) test. The commercial-bromate-malted wheat flour (No. 6) test was first used for part of the 1938 samples and has been continued for all of the 1939, 1940, 1941, and 1942 samples. This test seems to reveal the maximum strength of the wheats shown by the larger loaf volumes. This baking formula makes provision for adequate gas production by the employment of sufficient sugar and diastatic supplements. Each year other methods were used for certain samples or varieties. The only special tests made in 1942 were on the Eastern and Western composites for the eight uniform varieties by the Minnesota and North Dakota laboratory methods, and bromate response tests on spring and winter samples from Sheridan, Wyo.

Table 1.--Baking methods used for samples of the 1942 crop

Ingredients	Baking methods		
	No. 2	No. 3	No. 6
	Commercial	Commercial-bromate	Commercial-bromate-malted wheat flour
Flour (grams) (13.5 percent moisture basis)	100.0	100.0	100.0
Yeast (grams)	2.0	2.0	2.0
Salt (grams)	1.5	1.5	1.5
Sugar (grams)	5.0	5.0	5.0
Potassium bromate (grams)		.001	.001
Malted wheat flour (grams)			.25
Dried skimmilk (grams)	4.0	4.0	4.0
Shortening (grams)	3.0	3.0	3.0
Water absorption (percent)	Optimum	Optimum	Optimum
Mixing time (minutes)	Optimum for each variety	Optimum for each variety	Optimum for each variety
Fermentation time (minutes)	180	180	180
Fermentation periods:			
1st punch after 105 minutes, and			
2d punch after additional 50 minutes.			
Mold after additional 25 minutes.			
Proofing time - 55 minutes.			
Baked 25 minutes at 230°C.			

In the following tables, loaf volumes are reported for the different methods of baking used, but only averages are given for absorption, weight, crumb color, and grain-texture of loaf. The optimum or highest volume for any method, is shown in the tables also, but the varieties are ranked in order of their average volumes for the four different methods. The highest ranking variety with respect to each property is indicated by underlining. Since duplicate determinations were not made in most cases, it is not possible to correctly estimate random errors. Three baking methods were used in all cases,

however, and it is possible to calculate errors by considering these as replicate bakes. The standard errors so calculated are in reality the interaction of baking method x variety. A double underline is drawn in each table separating those varieties which are significantly lower (using interaction as error) than the one having the highest average volume in the test. It should be noted that interaction error is never less (within the limits of sampling error) than the true error but may be much greater, depending on whether varieties respond alike or differently to the different baking methods. Inspection of the data indicates that in some cases not all varieties responded alike to the different baking methods from which it may be inferred that the calculated errors (variety x method interaction) are in excess of the true errors. This is in accord with other studies in this laboratory in which true errors have been calculated and found to be in the range of 15 to 20 cc for a single determination.

All test weights were determined in the laboratory on a dockage-free basis. The protein and ash contents and water absorption are reported on a 13.5 percent moisture basis and the flour yield on a moisture-free basis.

EXPERIMENTAL RESULTS

The results for the regular methods on plot and nursery composite and station samples are given in tables 2 to 7, for bromate response in table 8; for the Minnesota and North Dakota methods and summary in table 9. The results for the commercial samples are shown in table 10. Summaries of the comparable 1942 samples are averaged in table 11 and five years' results in table 12. These tables are largely self-explanatory.

Acre yields are included, where comparable, to assist in the interpretation of results. The test weights for most of the composite and station samples were satisfactory.

REGULAR METHODS

The baking methods, Nos. 2, 3, and 6, were used as in previous years, for the bulk of the composite and station samples. Tables 2 to 12 contain the detailed results. The milling and chemical data in table 2 are not repeated for the other baking methods reported in table 9.

Plot Samples

1/ Yield, milling, baking, and chemical results on the uniform varieties of hard red spring wheat grown in plot experiments from the Eastern and the Western composites of the 1942 crop

Variety or Cross	C. I. No.	Acro yield	Test weight	Protein content		Wheat ash	Flour		Water absorption average	Baking method 2/				Average weight of loaf	Average crumb color	Average grain texture	(Score)
				Wheat	Flour		Yield	Ash		No. 2	No. 3	No. 6	Opti-mum				
				(Pct.)	(Pct.)	(Pct.)			(Pct.)					(Cc)	(Cc)	(Cc)	(Cc)
Eastern Composite 3/																	
Regent	12070	35.3	58.7	15.6	14.9	1.81	72.0	.47	63	815	953	988	988	919	150	92	83
Hope x Thatcher 3	12044	38.3	58.0	15.8	14.8	1.84	72.0	.52	62	835	936	974	974	915	149	90	90
Pilot	11945	40.3	58.7	14.5	13.3	1.99	72.3	.47	62	853	908	951	951	904	149	97	90
Thatcher	10003	29.4	57.0	14.2	13.5	1.74	73.6	.55	62	820	925	951	951	899	149	92	88
Merit x Thatcher	12053	37.7	58.1	15.3	14.7	1.68	70.9	.48	67	783	936	959	959	893	153	95	88
Renown	11947	35.1	60.0	15.4	14.4	1.82	71.9	.48	60	795	933	942	942	890	147	95	92
Rival	11708	37.5	59.4	14.8	14.1	1.73	73.4	.53	66	781	899	914	914	865	152	97	92
Marquis	3641	28.9	58.4	13.6	12.8	1.85	71.7	.57	62	743	829	893	893	822	151	97	88
Average	35.3	58.5	14.9	14.1	1.81	72.2	.51	63	803	915	947	947	888	919	150	94	89
Range	11.4	3.0	2.2	2.1	.31	2.7	.10	7	110	124	95	95	97	6	7	7	9
Western Composite 4/																	
Pilot	11945	22.6	57.0	15.0	14.1	1.83	70.7	.54	60	841	879	939	939	886	147	93	88
Thatcher	10003	21.1	57.6	15.3	14.8	1.75	72.1	.61	60	752	807	882	882	814	147	92	90
Marquis	3641	17.2	57.6	14.7	14.0	1.81	68.4	.51	60	738	830	865	865	811	149	95	93
Rival	11708	20.8	57.7	14.9	14.1	1.82	73.0	.60	63	700	809	917	917	809	149	95	88
Cores	6900	20.9	58.5	14.9	14.2	1.82	68.6	.56	64	764	804	859	859	809	150	95	90
Regent	12070	20.0	57.7	15.4	15.0	1.82	71.7	.54	60	703	809	874	874	795	149	92	90
Renown	11947	18.0	58.9	15.4	14.8	1.85	72.3	.56	60	677	812	870	870	787	149	93	88
Merit x Thatcher	12053	21.4	56.2	15.6	15.0	1.88	71.5	.61	63	643	795	879	879	772	151	92	87
Average	20.3	57.7	15.2	14.5	1.83	71.0	.57	61	727	818	886	886	810	810	149	93	89
Range	5.4	2.7	.9	1.0	.13	4.6	.10	4	198	84	30	80	114	3	4	3	6

1/ Average yield of these stations included in the composite.

2/ Standard error (variety x method interaction) for a single determination = 19.4 cc for the Eastern composite and 29.5 for the Western composite.

3/ Four pounds each from the St. Paul, Waseca, Morris, Crookston, Langdon, Fargo, and Brookings stations. Milled on the Buhler mill.

4/ Four pounds each for the Dickinson, Havre, Moccasin, Newell, Sheridan, Akron, North Platte and Alliance stations. Milled on Buhler mill.

Table 2.--(Continued)

Variety or Cross	C. I. No.	Acre yield	Test weight	Protein content		Wheat ash	Flour		Water absorption average	Baking methods and Loaf volume				Average		
				Wheat	Flour		Yield	Ash		No. 2	No. 3	No. 6	Opti-mum	Aver- age	Weight of loaf	Grain and color Texture
Average of Eastern and Western composites, 1942																
Pilot	11945	31.5	57.9	14.8	13.7	1.91	71.5	.51	61	847	894	945	945	895	148	95
Regent	12070	27.7	58.2	15.5	15.0	1.82	71.9	.51	62	759	881	931	931	857	150	92
Thatcher	10003	25.4	57.3	14.8	14.2	1.75	72.9	.58	61	786	866	917	917	857	148	92
Renown	11947	26.6	59.5	15.4	14.6	1.84	72.1	.52	60	736	873	906	906	838	148	94
Rival	11708	29.2	58.6	14.9	14.1	1.78	73.2	.57	65	741	854	916	916	837	151	96
Merit x Thatcher	12053	29.6	57.2	15.5	14.9	1.78	71.2	.55	65	713	866	919	919	833	152	94
Marquis	3641	23.1	58.0	14.2	13.4	1.85	70.1	.54	61	741	830	879	879	817	150	96
Average		27.6	58.1	15.0	14.3	1.82	71.8	.54	62	760	866	916	916	848	150	94
Range		8.4	2.3	1.3	1.6	.16	3.1	.07	5	13.4	64	66	66	78	4	4
Average of 1938, 1939, 1940, 1941, and 1942 composites																
Pilot	11945	25.9	57.2	15.7	14.8		69.8	.55	63.7	872	927	951	954	917	149	86
Thatcher	10003	24.2	56.9	15.6	15.1		70.6	.56	64.4	839	913	946	946	899	150	85
Ceros	6900	20.8	57.4	15.3	14.6		69.0	.56	65.4	840	873	907	912	873	150	85
Rival	11708	25.1	57.9	15.4	14.6		71.8	.58	65.6	801	875	914	914	863	150	86
Marquis	3641	18.3	55.3	15.0	14.2		67.6	.60	62.1	805	865	891	900	854	149	86
Average		22.9	56.9	15.4	14.7		69.3	.57	64.2	831	891	922	925	831	150	86
Range		7.6	2.6	.7	.9		4.2	.05	3.5	71	62	75	54	63	1	3

1/ Standard error (variety x method interaction) for a single determination = 22.7 cc for Eastern and Western composites, 1942.

2/ Results from the Western composite only in 1942.

Table 3.--Yield, milling, baking and chemical results for some of the hard red spring wheats grown in plot experiments at 14 experiment stations in 1942

St. Paul, Minn.

Variety or Cross	Nursery number	C. I. number	Acres Yield	Test weight	Protein content		Wheat ash.	Flour		Water absorption	Baking method and loaf volume						Average age weight of loaf	Average age crumb color	Average age grain and texture								
					Wheat	Flour		Yield	Ash		(Pct.)	(Pct.)	(Cc)	(Cc)	(Cc)	(Cc)											
																				(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Cc)	(Cc)	(Cc)	(Cc)
3	II-31-6	12043	44.8	56.4	15.5	14.6	1.82	72.3	.56	62	923	954	997	997	960	146	90	90									
Hope x Thatcher 3	Minn. 2718	12295	43.5	56.4	14.5	14.9	1.76	72.3	.54	62	885	915	965	965	932	146	90	92									
Hope x Thatcher 3	II-31-14	12044	42.2	55.6	14.5	14.1	1.84	72.4	.54	62	397	914	942	942	916	145	87	92									
Hope x Thatcher 3	II-31-2	12199	38.7	56.2	15.0	14.6	1.80	73.5	.66	64	350	934	954	954	913	150	92	83									
Rel.-Hope x Comet-1121	1520	12050	45.6	57.8	14.2	13.0	1.61	72.2	.43	60	832	874	897	897	868	126	93	83									
Merit x Thatcher	1597	12053	41.7	57.4	14.6	13.3	1.71	71.6	.56	62	743	873	928	928	843	143	90	93									
Pilot 2	1098-13	11945	39.4	57.3	13.7	12.7	1.75	70.6	.54	60	832	838	862	862	844	146	92	92									
Mercury x Comet-1018	2822	12071	41.0	57.3	13.9	13.2	1.71	72.8	.53	63	786	850	894	894	843	148	90	92									
C.-D.C. x Mercury	2829	12008	40.8	60.0	14.0	13.0	1.80	73.3	.50	62	841	809	876	876	848	148	92	92									
Thatcher	10003	26.2	54.3	12.9	12.2	1.80	69.0	.57	60	772	801	847	847	807	146	87	90	90									
Average			39.0	56.9	14.3	13.6	1.76	72.0	.55	62	837	879	916	916	877	147	90	91									
Range			19.4	3.5	2.6	2.7	0.13	4.5	.18	4	185	153	150	150	118	5	6	5									

1/ Standard error (variety x method interaction) for a single determination = 17.5 cc.

Waseca, Minn.

Renown 3	11947	30.2	59.2	13.3	12.6	---	73.5	.55	60	803	891	917	917	870	146	88	93	93
Hopc x Thatcher 3	II-31-2	12199	30.0	56.0	14.0	13.5	1.99	73.3	.70	62	829	838	931	931	866	147	92	92
Hopc x Thatcher 3	II-31-6	12043	29.6	57.1	14.9	14.5	1.94	73.8	.60	63	812	853	920	920	862	149	98	92
Hopc x Thatcher 3	II-31-14	12044	30.6	56.5	13.6	13.1	---	72.9	.62	60	833	847	891	891	857	146	87	90
Pilot	1098-13	11945	31.6	57.7	12.7	12.1	---	72.5	.62	60	812	838	894	894	850	147	93	93
Thatcher	10003	23.3	56.4	13.2	12.6	---	72.6	.57	60	792	847	902	902	847	147	85	90	90
C.-D.C. x Mercury	2829	12003	31.0	59.0	13.5	12.6	2.00	71.9	.58	60	800	818	879	879	832	146	92	90
Hopc x Thatcher 3	Minn. 2718	12295	28.2	57.0	13.7	13.4	1.89	73.4	.57	60	784	838	873	873	832	147	95	92
Merit x Thatcher	1597	12053	31.8	57.5	13.6	12.9	1.83	70.4	.65	62	769	835	888	888	831	143	92	92
Mercury x Comet-1018	2822	12071	30.7	57.8	13.4	12.5	1.82	72.9	.57	62	772	818	865	865	818	148	87	92
Rel.-Hopc x Comet-1121	1520	12050	28.1	58.6	13.1	11.9	2.03	74.7	.60	60	784	809	809	809	801	147	97	85
Merit	1348-3	12036	31.9	55.8	12.9	12.0	1.72	73.3	.53	62	697	806	850	850	784	147	87	87
Average			29.8	57.4	13.5	12.8	1.90	72.9	.60	61	791	837	885	885	836	147	91	91
Range			8.6	3.2	2.2	2.6	0.31	4.3	.15	3	136	85	122	122	86	3	13	8

1/ Standard error (variety x method interaction) for a single determination = 20.6 cc.

Table 3.---(Continued)

Morris, Minn.

Variety or Cross	Nursery number	C. I. number	Acre yield	Test weight (lbs.)	Protein content		Wheat ash		Flour		Water absorption Ave.	Baking method and loaf volume 1/				Weight of loaf (Grams)	Average		Grain and color test (Score)
					Wheat	Flour	Wheat	ash	Yield	Ash		No. 2	No. 3	No. 6	Opti- mum		Crumb (Score)	Color (Score)	
Hope x Thatcher 3	Minn. 2718	12295	45.5	58.6	(Pct.) 14.6	(Pct.) 14.0	(Pct.) 1.75	(Pct.) .52	(Pct.) 72.9	(Pct.) .52	62	(Cc.) 888	(Cc.) 930	(Cc.) 957	(Cc.) 957	146	90	85	95
Hope x Thatcher 3	II-31-2	12199	43.1	58.0	(Pct.) 14.6	(Pct.) 14.0	(Pct.) 1.77	(Pct.) .55	(Pct.) 72.2	(Pct.) .55	62	(Cc.) 868	(Cc.) 922	(Cc.) 962	(Cc.) 917	146	90	88	95
Rel.-Hope x Comet 1018	1530	12050	42.0	59.5	(Pct.) 13.9	(Pct.) 12.8	(Pct.) 1.61	(Pct.) .46	(Pct.) 72.9	(Pct.) .46	60	(Cc.) 836	(Cc.) 888	(Cc.) 931	(Cc.) 885	145	87	87	95
Rival 3	Ms. 2634	11708	48.8	60.0	(Pct.) 14.7	(Pct.) 13.7	(Pct.) 1.66	(Pct.) .52	(Pct.) 72.2	(Pct.) .52	63	(Cc.) 803	(Cc.) 908	(Cc.) 939	(Cc.) 883	148	93	90	95
Hope x Thatcher 3	II-31-14	12044	46.1	58.3	(Pct.) 13.7	(Pct.) 13.4	(Pct.) 1.68	(Pct.) .54	(Pct.) 74.0	(Pct.) .54	62	(Cc.) 841	(Cc.) 885	(Cc.) 916	(Cc.) 881	145	90	87	95
C.-D.C. x Mercury 2829	12008	12008	40.4	61.0	(Pct.) 15.3	(Pct.) 14.3	(Pct.) 1.82	(Pct.) .58	(Pct.) 74.8	(Pct.) .58	60	(Cc.) 818	(Cc.) 896	(Cc.) 923	(Cc.) 879	147	93	92	95
Regent	R.L. 975.6	12070	44.1	59.8	(Pct.) 15.0	(Pct.) 13.9	(Pct.) 1.65	(Pct.) .49	(Pct.) 73.1	(Pct.) .49	60	(Cc.) 778	(Cc.) 897	(Cc.) 928	(Cc.) 868	146	92	88	95
Pilot	1098-13	11945	47.2	59.5	(Pct.) 14.0	(Pct.) 12.9	(Pct.) 1.62	(Pct.) .52	(Pct.) 71.7	(Pct.) .52	60	(Cc.) 821	(Cc.) 879	(Cc.) 899	(Cc.) 866	145	93	90	95
Hope x Thatcher 3	II-31-6	12043	38.7	58.3	(Pct.) 14.7	(Pct.) 14.1	(Pct.) 1.46	(Pct.) .65	(Pct.) 74.3	(Pct.) .65	64	(Cc.) 824	(Cc.) 818	(Cc.) 908	(Cc.) 850	147	97	92	95
Merit x Thatcher	1597	12053	42.5	60.0	(Pct.) 14.6	(Pct.) 14.0	(Pct.) 1.67	(Pct.) .59	(Pct.) 72.5	(Pct.) .59	61	(Cc.) 772	(Cc.) 868	(Cc.) 905	(Cc.) 848	150	97	88	95
Merit	1348-3	12036	43.4	58.4	(Pct.) 14.8	(Pct.) 13.7	(Pct.) 1.65	(Pct.) .50	(Pct.) 73.2	(Pct.) .50	61	(Cc.) 740	(Cc.) 879	(Cc.) 922	(Cc.) 847	150	88	88	95
Thatcher	10003	10003	39.3	58.1	(Pct.) 13.0	(Pct.) 12.3	(Pct.) 1.63	(Pct.) .55	(Pct.) 73.6	(Pct.) .55	60	(Cc.) 764	(Cc.) 847	(Cc.) 873	(Cc.) 828	146	90	90	95

Average

Range

1/ Standard error (variety x method interaction) for a single determination = 22.8 cc.

Crookston, Minn.

Thatcher 3	10003	31.2	56.5	15.4	14.7	1.41	70.5	.47	60	824	979	1032	1032	945	146	85	90	85	90
Hope x Thatcher 3	II-31-14	12044	39.8	59.0	16.6	15.7	1.51	73.7	.46	60	859	982	991	991	944	145	90	88	90
Hope x Thatcher 3	Comp.	12295	40.3	58.7	14.8	14.5	1.55	76.3	.62	63	795	934	968	968	899	149	93	92	92
Hope x Thatcher 3	II-31-2	12199	43.7	59.2	14.7	14.0	1.73	74.9	.48	60	832	911	945	945	896	145	88	93	93
Merit x Thatcher 3	1597	12053	36.9	57.4	15.8	14.8	1.50	73.5	.55	63	771	937	966	966	891	149	95	92	92
Hope x Thatcher 3	II-31-6	12043	41.6	59.4	15.3	14.5	1.64	74.8	.47	60	823	899	933	933	835	146	90	92	92
C.-D.C. x Mercury 2829	12008	44.5	60.6	14.0	13.5	1.64	74.8	.41	60	794	874	931	931	866	147	95	90	90	90
Pilot	1098-13	11945	42.6	59.6	13.4	13.0	1.81	72.3	.48	60	739	835	888	888	821	147	95	85	85
Mercury 2 x Comet-1018 2822	12071	41.5	59.3	14.6	13.8	1.72	75.9	.41	60	688	838	870	870	799	149	87	91	98	98
Average		40.2	58.9	15.9	14.3	1.61	74.1	.48	61	792	919	947	947	893	147	91	91	91	91
Range		13.3	4.1	3.2	2.7	1.40	5.4	.21	3	120	147	162	162	124	14	10	10	10	10

Single determination = 21.6
Standard error for a single determination = 21.6

Table 3.--(Continued)

Fargo, N. Dak.

Variety or Cross	Nursery number	C. I. number	Acres yield	Test weight	Protein content		Wheat ash	Flour		Water absorption Average	Baking method and loaf volume				Average weight of loaf	Average crumb color	Average grain and texture
					Wheat	Flour		Yield	Ash		No. 2	No. 3	No. 6	Optimum			
							(Pct.)								(Pct.)	(Pct.)	(Pct.)
					(Bu.)	(Lbs.)	(Pct.)	(Pct.)	(Pct.)		(Pct.)	(Pct.)	(Pct.)	(Cc)	(Cc)	(Cc)	(Cc)
Pilot	1098-13	11945	47.6	60.0	14.6	14.1	1.55	72.6	.48	60	928	968	1006	967	144	92	92
Moritz x Thatcher	1682	12203	43.8	60.6	16.0	14.7	1.59	72.1	.46	63	876	948	991	991	147	95	88
C.-D.C. x Mercury	2794-29	12296	48.6	60.2	15.7	15.1	1.65	73.6	.45	62	824	953	925	953	145	97	90
Hope x Thatcher	11-31-14	12044	40.8	60.1	16.1	15.5	1.67	73.5	.53	62	784	928	1015	1015	147	85	88
Ronown	11947	42.1	62.2	60.4	16.0	15.3	1.62	73.9	.49	60	780	945	973	973	146	92	88
Rival	11708	44.5	60.4	60.1	14.8	13.9	1.52	73.0	.48	63	850	913	923	923	147	93	95
Moritz x Thatcher	1597	12053	44.1	60.1	15.9	15.4	1.61	72.1	.48	64	812	931	942	942	149	92	93
Mercury 2 x Comet-1118	Ms. 2822	12071	46.2	60.0	16.0	15.3	1.60	74.2	.48	64	761	917	928	928	149	88	87
Thatcher	10003	38.3	59.2	61.8	14.4	14.0	1.61	73.2	.55	60	764	928	911	928	145	83	88
Regent	12070	41.3	61.8	61.8	15.7	15.5	1.85	72.6	.54	60	747	925	916	925	146	93	90
Rel.-Hope x Comet-1121	1520	12050	47.9	61.6	13.9	12.9	1.51	73.9	.43	60	804	879	900	900	145	92	92
C.-D.C. x Mercury	2854	12252	50.9	61.8	15.3	14.0	1.56	73.8	.44	60	841	882	856	882	145	92	88
Comet-1121 x Ceres-Hope	1593	12193	44.8	61.6	14.4	13.3	1.47	74.0	.40	60	821	865	876	876	147	92	87
x Florence																	
C.-D.C. x Mercury	Ms. 2829	12008	43.0	62.3	15.0	13.8	1.60	73.5	.44	62	772	882	891	891	146	92	90
Premier-40	Ms. 2772-40	12271	47.1	61.7	15.1	14.6	1.59	74.4	.45	61	753	859	879	879	147	93	92
Merit	1348-3	12036	44.0	59.5	14.9	14.2	1.54	74.8	.47	64	697	865	891	891	150	87	88
Average			44.8	60.8	15.2	14.5	1.60	73.5	.47	62	801	912	926	931	147	91	90
Range			12.6	3.1	2.2	2.6	.38	2.7	.15	4	231	109	159	139	6	14	6

1/ Standard error (variety x method interaction) for a single determination = 17.8 cc.

Table 3.---(Continued)

Langdon, N. Dak.

Variety or Cross	Nursery number	C. i. number	Acre yield	Test weight	Protein content		Wheat ash	Flour		Water absorption	Baking method and loaf volume				Average weight of loaf	Average crumb color	Average grain and texture
					Wheat	Flour		Yield	Ash		No. 2	No. 3	No. 6	Optimum			
			(Bu.)	(lbs.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Cc)	(Cc)	(Cc)	(Cc)	(Grams)	(Score)	(Score)
Rival		11708	33.8	60.8	14.3	13.4	1.50	71.6	.51	60	804	933	951	951	147	92	93
Hope x Thatcher 3	II-31-14	12044	34.2	59.3	14.8	14.1	1.50	73.4	.47	63	767	908	937	937	149	85	88
Pilot	1098-13	11945	34.2	59.4	14.5	13.9	1.53	72.5	.45	60	781	879	902	902	147	93	92
Morit x Thatcher	1597	12053	30.8	58.0	15.2	14.5	1.54	71.6	.51	65	721	893	908	908	151	90	92
Thatcher		10003	27.0	57.1	13.9	13.6	1.64	71.4	.51	60	795	856	873	873	147	87	92
Regent		12070	33.2	60.8	15.0	14.4	1.54	72.3	.42	62	724	853	899	899	149	88	90
Marquis		3641	28.3	58.0	13.9	13.0	1.92	70.4	.52	60	741	870	856	870	147	90	90
Renown		11947	30.5	61.2	14.7	13.9	1.73	74.0	.47	64	718	859	879	879	151	92	93
Vesta		11712	28.7	59.8	14.5	13.9	1.69	72.8	.48	60	712	826	891	891	147	93	93
Comet-1121 x C.H. x F. 1593		12193	37.2	61.4	13.2	12.3	1.50	73.9	.45	60	727	847	838	847	147	93	93
C.-D.C. x Mercury	Ns. 2829	12008	38.5	62.0	14.5	14.0	1.59	72.6	.45	60	721	836	838	838	148	92	88
C.-D.C. x Mercury	2794-34	12298	35.3	60.4	13.6	12.4	1.50	73.1	.44	63	746	818	827	827	149	92	92
Mercury x Comet-1018	Ns. 2822	12071	35.7	60.1	15.5	14.5	1.61	73.2	.51	62	685	792	808	808	150	92	92
Morit x Pilot	1652	12275	27.8	60.0	14.3	13.5	1.52	72.4	.50	64	658	859	832	859	150	90	92
Premier-10	2772-40	12271	37.3	61.4	14.1	13.6	1.55	72.4	.43	62	640	804	829	829	149	88	88
Morit	1348-3	12036	31.7	58.2	13.5	13.1	1.69	71.9	.49	63	663	775	833	833	151	87	88
Average			32.8	59.9	14.3	13.6	1.60	72.5	.48	62	725	851	874	877	149	90	91
Range			11.5	4.9	2.3	2.2	.42	3.6	.10	5	164	158	124	124	4	8	5

1/ Standard error (variety x method interaction) for a single determination = 28.9 cc.

Table 3.--(Continued)

Dickinson, N. Dak.

Variety or Cross	Nursery number	C. I. no.	Acre yield	Test weight	Protein content		Wheat ash	Flour		Water absorption Average	Baking method 1/ and loaf volume			Average				
					Wheat	Flour		Yield	Ash		No. 2	No. 3	No. 6	Opti- mum	Aver- age	Weight of loaf	Crumb color	Grain and texture
(Bu.) (Lbs.) (Pct.) (Pct.) (Pct.) (Cc.) (Cc.) (Cc.) (Cc.) (Grams) (Score) (Score)																		
Renown		11947	21.3	62.5	14.1	13.0	1.59	73.5	.47	60	735	833	922	922	830	148	92	
Pilot		11945	28.6	61.5	12.7	12.2	1.49	72.1	.45	60	789	847	835	847	824	148	95	
Regent		12070	29.0	61.8	14.5	13.5	1.61	72.4	.47	60	727	832	891	891	817	148	93	
Hope x Thatcher	11-31-14	12044	24.8	60.0	13.7	13.3	1.64	74.2	.50	60	758	792	865	865	805	147	87	
Rival		11708	27.8	62.3	13.5	12.7	1.49	73.5	.53	60	719	844	841	844	801	148	98	
Morit x Thatcher	1597	12053	29.3	61.3	13.3	12.6	1.48	74.1	.50	64	703	801	862	862	789	151	93	
Premier-40	Ns. 2772-40	12271	29.3	62.2	14.1	13.0	1.54	75.3	.49	63	732	795	834	834	786	150	97	
Vesta		11712	25.4	62.9	13.6	12.5	1.55	74.9	.49	60	735	780	807	807	774	148	98	
Rel.-Hope x Comet-1121	1520	12050	32.5	63.2	12.8	12.2	1.42	74.6	.45	60	727	775	815	815	772	147	92	
Comet-1110 x H-44 x Cores	1596	12052	31.7	62.4	12.6	11.6	1.49	75.4	.53	63	697	775	809	809	780	150	85	
Cores		6900	24.6	61.6	12.9	11.9	1.53	72.9	.48	62	685	744	824	824	751	150	82	
Thatcher		10003	24.0	60.7	12.7	12.2	1.53	72.8	.52	60	660	749	821	821	743	148	88	
C.-D.C. x Mercury	Ns. 2794-34	12293	33.3	61.9	12.8	11.8	1.59	74.3	.51	62	697	732	787	787	739	150	97	
Marquis		3641	14.9	61.2	11.7	11.3	1.53	71.9	.51	60	652	741	778	778	724	143	92	
C.-D.C. x Mercury	Ns. 2975	12300	31.5	61.3	12.0	10.8	1.59	74.9	.53	60	649	692	727	727	689	150	82	
Average			27.2	61.8	13.1	12.3	1.54	73.8	.50	61	711	782	828	829	774	149	92	
Range			13.4	3.2	2.8	2.7	.22	3.5	.08	4	140	155	195	195	141	4	16	

1/ Standard error (variety x method interaction) for a single determination = 29.9 cc.

Madison, Wis.

Pilot	1098-13	11945	30.3	58.0	11.9	10.2	1.80	71.8	.60	60	740	743	793	798	95	90
Ill. 1-Hope x Webster-Roscoe	Wis. 233	12265	31.0	58.8	11.6	10.4	1.88	73.0	.55	60	724	736	781	781	82	87
Hope x Thatcher	3	12044	26.0	57.2	12.5	12.0	1.65	71.1	.57	60	721	735	769	742	82	83
Merit x Thatcher	1597	12053	29.1	58.0	12.3	10.8	1.54	70.5	.60	62	683	729	726	713	93	88
Thatcher		10003	24.3	57.7	11.2	10.1	1.80	71.0	.58	60	657	652	700	670	90	83
Average			28.2	57.9	11.9	10.7	1.73	71.5	.58	60	705	719	755	726	88	87
Range			6.7	1.6	1.3	1.9	.34	2.5	.05	2	83	91	98	90	13	7

1/ Standard error (variety x method interaction) for a single determination = 18.2 cc.

Table 3.--(Continued)

Havre, Mont.

Variety or Cross	Nursery number	C. I. no.	Acre yield	Test weight	Protein content		Wheat ash	Flour		Water absorption Average	Baking method 1/ and loaf volume				Average weight of loaf	Crumb color	Grain and texture	
					content			Yield	Ash		No. 2	No. 3	No. 6	Optimum				Average
					Wheat	Flour												
			(Bu.)	(Lbs.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Cc.)	(Cc.)	(Cc.)	(Cc.)	(Grams)	(Score)	(Score)	
Thatcher		10003	25.3	52.5	18.3	17.7	1.84	69.7	.53	62	891	1038	1067	1067	999	146	83	85
Cores		6900	22.0	55.4	17.6	17.0	1.88	70.7	.54	63	856	1000	1012	1012	956	148	88	88
Renown		11947	21.1	55.1	17.7	17.0	1.88	71.8	.55	65	815	1015	1024	1024	951	150	85	83
Pilot	1098-13	11945	23.6	53.0	17.5	16.7	1.86	70.7	.52	63	826	1009	988	1009	941	149	87	85
Reward		8182	23.9	58.6	18.1	17.1	1.67	71.3	.43	62	817	985	994	994	932	147	90	87
Regent		12070	22.8	53.2	18.0	17.5	1.93	70.7	.50	62	792	974	1009	1009	925	149	83	83
Rel.-Hope x Comet-1121	1520	12050	22.8	54.3	17.7	17.2	1.82	71.2	.47	62	786	968	994	994	916	148	83	83
Marquis		3641	25.0	57.0	17.1	16.3	1.73	69.7	.51	62	812	937	965	965	905	147	93	85
Rival		11708	24.4	54.5	16.4	15.7	1.73	73.8	.57	64	801	934	959	959	898	150	88	85
Vesta		11712	23.1	55.5	16.6	15.8	1.75	72.9	.49	62	815	913	936	936	888	149	90	87
Supreme		8026	26.7	56.7	15.4	14.3	1.67	70.2	.50	62	775	902	948	948	875	148	85	87
Merit. x Thatcher	1597	12053	25.6	53.8	17.6	17.1	1.78	69.5	.53	66	724	936	959	959	873	163	85	85
Merit	1348-3	12033	21.4	53.7	17.6	16.9	1.84	72.1	.50	56	729	885	914	914	843	152	83	83
Average			23.7	54.9	17.4	16.6	1.80	71.1	.52	63	803	961	982	984	916	149	86	85
Range			5.6	6.1	2.9	3.4	.26	4.3	.17	4	167	153	153	153	156	7	10	5

1/ Standard error (variety x method interaction) for a single determination = 12.0 cc.

Table 3.--(Continued)

Brookings, S. Dak.

Variety or Cross	Nursery number	C. I. no.	Acre yield	Test weight	Protein content		Flour		Water absorption Average	Baking method 1/				Average				
					Wheat	Flour	Yield	Ash		No. 2	No. 3	No. 6	Optimum	Average	Weight of loaf	Crumb color	Grain and texture	
(Bu.)	(Lbs.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Cc.)	(Cc.)	(Cc.)	(Cc.)	(Grams)	(Score)	(Score)						
Ceres		6900	27.4	54.8	14.1	13.0	2.00	71.0	.55	60	942	991	940	991	958	146	78	85
Rival x Thatcher	2280	12273	34.6	56.2	16.2	15.7	1.98	71.3	.56	60	890	960	1000	1000	950	144	82	90
Rival x Thatcher	2403	12299	35.3	55.2	15.4	14.8	1.90	72.1	.63	60	879	951	925	951	918	145	90	88
Rival x Thatcher	2259	12272	44.6	56.6	15.6	14.4	1.86	72.6	.54	60	815	948	968	968	910	145	85	88
Rival		11708	37.3	59.6	14.5	13.8	1.84	72.3	.60	63	691	838	888	883	806	149	88	92
Thatcher		10003	20.7	59.2	14.4	13.6	1.93	71.4	.65	62	685	847	879	879	804	149	82	85
Average			33.3	56.9	15.0	14.2	1.93	71.8	.59	61	817	923	933	946	891	146	84	88
Range			23.9	4.8	2.1	2.7	.16	1.6	.09	3	257	153	112	112	154	5	8	7

1/ Standard error (variety x method interaction) for a single determination = 41.7 cc.

Eureka, S. Dak.

Rival x Thatcher	2403	12299	29.7	61.1	14.9	13.6	1.61	73.3	.53	62	812	844	882	882	846	149	103	90
Rival x Thatcher	2280	12273	25.5	60.6	14.5	13.2	1.69	74.1	.53	60	712	832	873	873	806	149	93	88
Rival x Thatcher	2259	12272	38.2	61.1	13.5	12.8	1.53	72.5	.50	62	727	826	847	847	800	149	92	87
Rival		11708	34.0	61.6	13.5	13.0	1.49	74.3	.50	63	731	778	844	844	784	151	93	88
Thatcher		10003	27.4	59.8	13.5	12.9	1.61	73.9	.56	60	683	776	818	818	759	150	87	92
Average			31.0	60.8	14.0	13.1	1.59	73.6	.52	61	733	811	853	853	799	150	94	89
Range			10.8	1.7	1.4	.8	.20	1.8	.06	3	129	68	64	64	87	3	10	5

1/ Standard error (variety x method interaction) for a single determination = 21.4 cc.

Newell, S. Dak.

Merit x Thatcher	1682	12203	30.4	60.8	12.2	11.3	1.86	72.2	.72	65	706	775	803	803	761	154	88	87
Pilot	1098-13	11945	37.6	60.8	11.7	10.6	1.82	72.6	.49	60	732	721	786	786	746	148	92	92
Merit x Thatcher	1597	12053	33.3	61.0	12.5	12.0	1.86	71.8	.56	61	643	740	806	806	730	153	90	83
Thatcher		10003	29.3	60.6	12.6	12.0	1.74	72.7	.56	60	643	730	783	783	718	149	87	83
Average			32.7	60.8	12.3	11.5	1.82	72.3	.58	62	681	742	795	795	739	151	89	86
Range			8.3	.4	.9	1.4	.12	.9	.23	5	89	54	23	23	43	6	5	9

1/ Standard error (variety x method interaction) for a single determination = 29.0 cc.

Table 3.--(Continued)

Moccasin, Mont.

Variety or Cross	Nursery number	C. I. Acre yield no.	Test weight	Protein content		Wheat ash	Flour		Water absorption Average	Baking method and loaf volume 1/			Average				
				Wheat	Flour		Yield	Ash		No. 2	No. 3	No. 6	Optimum	Average			
(Bu.)	(Lbs.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Cc.)	(Cc.)	(Cc.)	(Cc.)	(Grams)	(Score)	(Score)		
Renown		11947	19.9	63.0	13.6	12.6	1.82	71.9	.45	60	798	789	815	801	146	87	90
Reward		8182	22.8	63.7	14.4	13.6	1.65	70.4	.49	60	749	770	798	772	146	92	92
Regent		12070	23.8	62.3	13.5	12.7	1.72	71.9	.51	62	772	764	769	772	148	83	90
Comet x N. No. 1110	1466	11931	22.1	63.4	12.9	11.7	1.58	75.1	.49	60	755	706	694	755	148	82	90
Vesta		11712	20.9	62.4	12.9	12.1	1.57	74.7	.58	60	743	688	724	743	147	90	90
Rival		11708	19.8	61.6	13.9	12.6	1.83	71.6	.46	62	694	717	732	732	148	80	85
Merit x Thatcher	1597	12053	23.0	60.5	13.1	12.1	1.87	70.6	.46	64	694	663	706	706	150	90	90
Merit	1340-3	12036	23.5	61.1	12.4	11.6	1.72	74.6	.52	61	743	666	643	743	151	78	87
Supreme		3026	23.9	62.5	11.6	10.6	1.33	72.9	.61	60	630	651	700	677	149	73	83
Pilot		11945	22.3	61.9	12.3	11.3	1.62	71.1	.49	60	689	668	635	689	149	72	83
Marquis		3641	21.5	62.9	12.4	11.7	1.71	70.5	.53	60	675	648	641	675	148	90	87
Thatcher		10003	24.8	62.1	12.8	11.9	1.66	71.9	.46	60	646	652	620	652	147	75	83
Rel. Hope x Comet-1110	1520	12050	26.4	63.0	11.8	11.0	1.53	73.7	.46	60	635	599	626	635	150	73	78
Ceres		6900	22.1	62.7	12.9	12.1	1.56	71.0	.47	60	590	602	587	602	149	68	78
Comet x N. No. 1018	1315	12060	27.6	61.7	11.2	10.2	1.46	71.8	.47	62	568	532	573	573	153	70	73
Average		23.0	62.3	12.8	11.9	1.66	72.2	.50	61	695	674	684	706	685	149	80	85
Range		7.8	3.2	3.2	3.1	.42	.47	.16	4	230	257	242	242	243	7	24	19

1/ Standard error (variety x method interaction) for a single determination = 24.2 cc.

Table 3.--(Concluded)

Sheridan, Wyo.

Variety or Cross	Nursery number	C. I. no.	Acre yield (Bu.)	Test weight (Lbs.)	Protein content		Wheat ash, (Pct.)	Flour		Water absorption, (Pct.)	Baking method and loaf volume				Average	
					Wheat	Flour		Yield	Ash		No. 2	No. 3	No. 6	Optimum	Weight of loaf (Grams)	Crumb color (Score)
Comet x Pilot	1585	12073	30.3	55.4	17.2	16.4	1.70	69.2	.44	60	841	962	1018	1018	144	78
Pilot	1098-13	11945	24.4	55.0	18.1	17.2	1.78	69.1	.45	60	821	985	1009	1009	144	80
Ceres		6900	25.7	57.8	18.4	17.9	1.72	68.6	.46	62	787	962	1038	1038	146	82
Comet x N. No. 1121	1584	12258	26.0	55.1	17.9	17.0	1.76	69.7	.49	60	795	942	1017	1017	144	78
Thatcher		10003	22.9	55.2	18.6	18.0	1.67	69.1	.42	60	807	942	982	982	145	83
Regent		12070	23.2	55.1	18.4	17.2	1.55	68.2	.42	62	775	939	994	994	147	82
C.-D.C. x Ceres - H.F.Ns. 2829		12008	27.2	58.2	17.1	16.1	1.71	71.6	.42	60	775	951	976	976	146	90
Marquis		3641	22.0	56.5	18.9	18.0	1.90	68.7	.44	60	789	931	965	965	144	83
Comet-1110 x H-44 x Ceres	1586	12276	27.5	55.9	17.8	16.9	1.79	70.7	.50	62	778	896	965	965	145	78
Merit x Thatcher	1682	12203	23.8	53.9	19.3	18.8	1.89	69.8	.54	62	712	882	1035	1035	147	80
Rival		11708	22.6	56.9	16.9	16.0	1.98	73.9	.49	62	694	914	937	937	147	85
Merit x Thatcher	1597	12053	19.0	54.5	18.9	18.7	1.84	70.1	.51	53	691	897	937	937	148	73
Rel.-Hope x Comet 1121	1520	12050	20.2	54.7	18.7	17.2	1.71	68.5	.45	60	733	876	902	902	145	78
Comet x 1110	1466	11931	28.1	59.8	18.1	17.2	1.67	72.9	.46	62	706	865	917	917	147	77
Hope x Thatcher 3	11-31-14	12044	23.5	53.8	18.0	17.3	1.79	69.8	.50	60	691	835	902	902	145	72
Average			24.4	55.8	18.2	17.3	1.77	70.0	.47	61	760	919	973	973	145	80
Range			11.3	5.0	2.4	2.8	.43	5.7	.12	3	150	150	136	136	4	18

1/ Standard error (variety x method interaction) for a single determination = 27.9 cc.

Table 4.--Milling, baking, and chemical results on new hybrid hard red spring wheats grown in increase plots from late seeding (Arizona increases) at two stations in 1942

Langdon, N. Dak.

Variety or Cross	Nursery number	C. I. no.	Test weight	Protein content		Wheat ash	Flour		Water absorption	Baking method 1/ and loaf volume				Weight of loaf	Average	
				Wheat	Flour		No. 2	No. 3		No. 6	Opti-mum	Aver-age	Crumb color		Grain and texture	
			(Lbs.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Cc.)	(Cc.)	(Cc.)	(Cc.)	(Grams)	(Score)	(Score)
Regent x Pilot-13	1753	12317	59.5	16.2	15.1	1.69	70.7	.53	65	818	994	1038	1038	950	90	82
Ns.2742 x N.1574	1758		56.2	16.5	16.2	1.72	68.9	.47	62	743	923	948	948	871	90	83
Pilot-13 x Ns.2742	1756	12303	61.1	15.2	13.9	1.66	72.4	.47	63	770	887	954	954	870	90	85
Ns.2742 x Morit x Thatcher	1752	12321	60.4	15.6	15.3	1.70	73.9	.48	64	743	899	957	957	866	87	85
Comet-1121 x Morit	1707		59.1	16.6	16.0	1.70	71.1	.50	64	729	893	973	973	865	85	85
Pilot-13 x Ns.2742	1751		60.3	15.8	14.9	1.73	71.6	.48	60	746	908	914	914	856	88	85
Merit x Komar-Hussar-Cores	1685		57.0	15.2	14.4	1.64	70.2	.45	65	738	891	936	936	855	82	85
Comet-Pilot x Comet-1121	1689	12382	58.1	15.1	14.8	1.54	71.3	.48	64	734	879	948	948	851	88	88
Morit x Thatcher	1755		58.7	15.6	14.6	1.69	69.1	.52	67	740	876	937	937	851	85	80
Rel.-Hope x H-44-Cores	1705	12320	60.0	15.1	14.8	1.73	72.7	.50	61	755	870	922	922	849	78	82
Morit x Thatcher	1625	12279	58.1	14.6	14.1	1.63	71.7	.52	62	743	885	911	911	846	88	83
Comet-1121 x Cores -H.xf.	1675		50.5	13.6	12.3	1.64	72.1	.48	60	737	879	888	888	835	85	85
Pilot-13 x Ns.2742	1750	12316	61.7	15.7	15.1	1.77	71.4	.48	60	767	841	888	888	832	92	92
Ns.2742 x N.1574	1760	12322	60.3	16.6	15.8	1.76	70.8	.52	60	721	876	890	890	830	87	80
Pilot (Check)	1098-13	11945	57.2	15.3	14.4	1.82	71.4	.52	60	744	865	877	877	829	87	87
Merit x Thatcher	1632	12280	58.4	16.1	15.2	1.64	71.3	.52	65	703	838	923	923	821	82	82
Comet-1110 x Pilot	1633-1		60.7	14.7	14.5	1.51	71.7	.45	62	695	871	896	896	821	80	85
Rel.-1018 x Mercury	1640		59.6	14.9	14.6	1.62	72.5	.47	62	706	838	908	908	817	82	85
Ns.2742 x N.1529	1757		57.3	16.0	15.5	1.69	70.3	.50	63	721	841	864	864	810	80	80
Ns.2742 x N.1574	1759		57.7	16.1	15.2	1.80	70.5	.49	62	712	854	865	865	809	78	80
Merit x Pilot	1652	12275	58.7	14.6	15.2	1.66	70.9	.55	64	669	829	900	900	799	82	82
Comet-1121 x Cores-H.xf.	1523-1-1	12047	60.1	14.6	14.0	1.73	73.8	.55	60	704	795	876	876	792	80	82
Regent x Morit	1754		58.7	16.0	15.2	1.75	73.1	.50	60	666	818	821	821	768	80	75
N.1131-Pilot x Renown	1674	12278	61.2	14.7	13.7	1.52	73.5	.49	62	694	787	789	789	757	83	82
Average			59.2	15.4	14.7	1.68	71.6	.50	63	729	868	909	909	836	85	83
Range			5.5	3.0	3.9	3.1	5.0	.10	7	152	207	249	249	193	14	17

1/ Standard error (variety x method interaction) for a single determination = 21.0 cc.

Table 4.--(Continued)

Dickinson, N. Dak.

Variety or Cross	Nursery number	C. I. no.	Test weight	Protein content		Wheat Flour	Flour		Water absorption Average	Baking method and loaf volume				Average			
				Wheat	Flour		Yield	Ash		No. 2	No. 3	No. 6	Opti- mum	Average	Weight of loaf	Crumb and color	Grain texture
			(Lbs.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Cc.)	(Cc.)	(Cc.)	(Cc.)	(Cc.)	(Grams)	(Score)	(Score)
Comet-Pilot x Comet-1121	1689	12262	59.2	12.7	12.1	1.57	71.8	.60	63	697	764	792	792	751	151	88	88
Rival		11708	61.9	12.1	11.3	1.50	74.5	.48	60	657	654	726	726	679	149	83	85
Ceres x Pilot	1556	12263	60.0	12.4	11.2	1.62	73.4	.51	60	651	651	732	732	678	147	85	85
Hope x Turkey-Florence	1563	12195	60.2	11.0	10.6	1.56	74.2	.60	60	643	651	694	694	663	149	80	85
Ceres-Komar-Hussar x Mercury	1650		60.1	11.9	11.0	1.64	73.4	.52	60	608	649	709	709	655	151	72	85
Hope x Turkey-Florence	1611		59.0	10.5	9.8	1.57	73.5	.52	60	599	638	694	694	644	151	78	80
Ceres-Komar-Hussar x Mercury	1651	12264	61.7	11.9	11.1	1.59	73.8	.55	60	581	602	677	677	620	150	75	80
Mercury x Komar-Hussar	1740		60.0	11.8	10.8	1.69	72.3	.54	62	590	308	657	657	618	155	73	80
Average			60.3	11.8	11.0	1.59	73.4	.54	61	628	652	710	710	664	150	79	84
Range			2.9	2.2	2.5	.19	2.7	.12	3	116	162	135	135	94	8	16	8

1/ Standard error (variety x method interaction) for a single determination = 26.3 cc.

Nursery Samples

Table 5.--Yield, milling, baking, and chemical results on 26 wheats grown in the Uniform Regional Nursery, for Eastern composite, Western composite, and average of Eastern and Western composites in 1942

Eastern Composite

Variety or Cross	Nursery number	C. I. no.	Acre yield (Bu.)	Test weight (lbs.)	Protein content		Wheat		Flour		Water absorption (Pct.)	Baking method and loaf volume				Average			
					Wheat	Flour	Ash	Carotene content	Yield	Ash		No. 2	No. 3	No. 6	Optimum	Average	Wgt. of loaf	Crumb color	Grain and texture
											(Pct.)								
Thatcher		10003	25.2	57.0	14.1	13.4	1.84	2.47	71.6	.55	60	870	917	911	917	899	145	87	92
Comet-Pilot x Comet-1121	1689	12262	30.4	58.7	15.0	14.4	1.96	2.13	72.8	.49	65	847	922	913	922	894	149	95	90
Hope x Thatcher	II-31-6	12043	30.8	58.0	15.8	15.4	1.93	2.01	73.5	.48	63	815	908	945	945	889	147	88	93
Marquis 2 x H-44	R.L.1333	12012	26.3	58.4	14.6	14.4	2.00	2.13	71.8	.61	60	823	893	937	937	884	145	88	92
Merit x Thatcher	1682	12203	30.8	57.3	14.7	14.3	1.64	2.01	71.6	.52	64	818	914	911	914	881	149	93	95
Hope x Thatcher	II-31-2	12199	34.1	59.6	14.9	14.0	1.71	2.24	74.4	.47	62	795	876	931	931	867	146	93	92
Rival x Thatcher	SD.2280	12273	35.2	60.0	15.0	14.2	1.84	1.79	75.6	.60	62	798	870	908	908	859	147	92	93
Comet x Pilot	1540-2	12274	32.5	59.4	14.8	14.6	1.89	2.47	72.7	.64	62	818	862	890	890	857	147	88	87
Hope x Thatcher	II-36-35	12268	33.6	59.0	15.4	14.9	1.82	2.13	73.2	.48	60	815	856	896	896	856	146	88	93
Marquis		3641	22.7	58.0	13.7	13.1	2.00	2.47	72.6	.64	60	786	870	850	870	835	146	88	90
Merit x Pilot	1652	12275	30.8	59.3	14.6	14.0	1.88	2.13	73.9	.58	65	712	853	922	922	829	150	93	92
C.-D.C. x Mercury	Ms.2794.19	12270	32.6	58.3	15.2	14.8	2.10	2.13	74.2	.58	61	731	838	856	856	825	151	92	93
Comet-1121 x C.-H. x F.	1593	12093	35.7	60.0	13.6	12.5	1.79	2.24	73.7	.41	60	778	838	850	850	822	147	85	92
Ceres-Konar-Hussar x Mercury	1651	12264	32.1	58.8	14.7	13.7	2.00	2.13	74.6	.44	60	804	821	829	829	818	149	88	93
C.-D.C. x Mercury	Ms.2849	12198	38.2	61.2	14.6	14.1	1.93	1.79	74.7	.47	62	781	841	832	841	818	147	97	93
Rel.-Hope x Comet-1121	1520	12050	32.8	59.5	14.5	13.9	1.84	2.47	74.3	.53	60	740	826	853	853	803	147	87	92
Rival x Thatcher	S.D.2259	12272	33.6	59.7	14.8	14.3	1.81	1.90	76.2	.66	60	749	798	862	862	803	145	92	93
Comet-Rel.-Hope x Ceres-H.F.	1523	12047	31.6	60.6	14.6	13.4	1.91	2.58	74.8	.63	60	734	835	838	838	802	147	92	92
Merit x Thatcher	1597	12053	29.1	58.0	14.9	14.3	1.93	2.47	73.8	.68	63	669	829	879	879	792	148	93	90
Ill.1 - Hope x Webster-Resaca	Wis.233	12265	39.6	60.0	13.7	12.3	1.83	2.01	74.7	.43	60	700	812	862	862	791	143	83	85
Mercury 2 x Comet-1018	Ms.2822	12071	31.6	58.4	14.4	13.9	1.64	2.13	76.3	.52	62	724	781	804	804	770	151	83	87
Ceres-Hope x Florence	II-36-18	12266	32.5	60.3	14.5	14.0	1.65	1.90	76.0	.54	63	740	753	806	806	763	150	88	90
Premier-40	Ms.2772.40	12271	32.4	59.7	14.7	14.0	2.00	2.13	76.2	.54	60	695	770	809	809	753	148	87	87
C.-D.C. x Mercury	Ms.2989	12269	35.6	60.3	13.4	12.6	2.10	2.13	74.7	.57	62	715	735	778	778	743	151	85	87
C.-Hope-Florence x Thatcher	II-36-19	12267	32.6	60.2	14.2	13.3	1.75	1.79	75.4	.50	62	694	749	781	781	741	149	88	88
Hope x Turkey-Florence	1563	12195	33.0	58.3	13.1	12.6	1.80	2.13	74.4	.48	60	660	697	726	726	694	150	75	77
Average			32.1	59.2	14.5	13.9	1.87	2.15	74.1	.54	62	764	833	861	862	819	148	89	90
Range			16.9	4.2	2.7	3.1	0.46	.79	4.6	.27	5	210	225	219	219	205	6	22	18

1/ Standard error (variety x method interaction) for a single determination = 26.0 cc.

Table 5.---(Continued)

Western Composite

Variety or Cross	Nursery number	C. I. no.	Acre yield (Bu.)	Test weight (Lbs.)	Protein content		Wheat		Flour		Water absorption		Baking method and loaf volume				Average	
					Wheat	Flour	Ash	Carot- enoid content	Yield	Ash	Average	No. 2	No. 3	No. 6	Opti- mum	Average	Wgt. of loaf	Crumb tex- ture and color
					(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Cc.)	(Cc.)	(Cc.)	(Cc.)	(Grams)	(Score)
3																		
Hope x Thatcher	11-36-35	12288	27.8	58.0	15.9	15.3	1.79	2.24	70.7	62	62	792	899	900	900	864	147	87
Hope x Thatcher	11-31-2	12199	27.3	57.3	15.5	15.0	1.89	2.69	70.8	62	63	724	890	899	899	838	148	92
Comet x Pilot	1540-2	12274	28.6	59.0	15.5	15.0	1.95	2.35	70.6	60	64	758	859	896	896	838	149	92
Thatcher	10003	12003	29.6	57.0	15.8	14.9	1.84	2.47	72.1	57	60	755	853	903	903	837	146	88
Hope x Thatcher	11-31-6	12043	26.3	57.0	16.4	15.9	2.00	2.24	72.3	67	62	705	888	899	899	831	147	90
Rival x Thatcher	S.D.2280	12273	29.2	59.5	15.2	15.0	1.83	2.01	73.1	65	63	720	862	899	899	827	148	92
Rival x Thatcher	S.D.2259	12272	28.7	58.5	14.8	14.1	1.82	1.79	73.2	56	62	764	847	859	859	823	148	93
Comet-Pilot x Comet-1121	1689	12262	28.5	59.0	14.7	14.3	1.81	2.35	71.9	57	66	749	829	885	885	821	152	98
Marquis 2 x H-44	R.L.1333	12012	26.0	57.8	15.1	13.9	1.89	2.47	71.9	53	60	719	835	896	896	817	145	95
Merit x Thatcher	1597	12053	33.2	56.5	16.4	15.0	1.85	2.35	72.3	65	65	694	873	885	885	817	150	93
Merit x Thatcher	1682	12203	28.2	57.1	15.1	14.5	1.81	2.24	70.8	61	64	703	818	899	899	807	151	95
C.-D.C. x C.H.F.	Ns.2849	12198	29.1	60.2	15.0	14.1	1.79	1.79	74.0	58	63	724	829	867	867	807	148	97
C.-D.C. x C.H.F.	Ns.2794.19	12270	28.0	58.0	14.9	14.0	1.90	1.79	73.1	66	67	683	826	841	841	783	153	93
Ill.No.1-Hope x Web.-Resaca	Wis.233	12265	31.1	57.0	15.0	13.7	1.75	2.69	73.0	53	60	683	812	850	850	782	149	78
Merit x Pilot	1652	12275	31.0	58.5	16.6	15.1	1.85	2.24	72.9	69	67	675	824	826	826	775	148	87
Marquis	3641	12047	29.0	58.7	14.8	14.2	1.86	2.13	72.3	67	60	680	815	823	823	773	146	93
Comet-Rel.Hope x C.H.F.	1523	12047	30.4	59.3	14.5	13.4	1.94	2.35	72.8	70	60	689	809	820	820	773	147	92
Rel.-Hope x Comet-1121	1520	12050	30.3	58.6	15.0	13.8	1.90	2.69	73.8	62	60	712	761	835	835	769	147	87
Comet-1121 x C.H.F.	1593	12193	27.7	58.6	15.1	13.9	1.76	2.35	74.2	51	60	695	783	821	821	766	145	93
Premier-40	Ns.2772.40	12271	29.5	58.6	14.9	13.5	1.98	2.01	74.6	56	63	688	769	821	821	759	151	92
Mercury 2 x Comet-1018	Ns.2822	12071	28.2	57.3	15.0	14.1	1.81	1.79	73.7	58	65	640	778	834	834	751	152	92
C.-H.F. x Thatcher	11-36-19	12267	30.5	59.0	14.7	13.9	1.74	1.90	73.3	62	63	651	752	795	795	733	149	93
C.-H.F. x Thatcher	11-36-18	12266	26.4	59.2	15.2	14.3	1.79	2.13	74.7	64	67	629	764	804	804	732	153	90
Coros-Komar-Hussar-Mercury	1651	12264	27.0	58.4	15.2	14.2	1.95	2.24	73.9	57	62	663	738	783	783	728	151	90
Coros-D.C. x C.H.F.	Ns.2989	12269	33.9	60.0	13.9	12.6	1.74	1.79	74.3	67	66	608	700	761	761	690	155	87
Hope x Turkey-Florence	1563	12195	26.6	55.9	14.0	13.4	1.96	2.47	74.0	62	60	567	660	712	712	646	150	82
Average			28.9	58.2	15.2	14.3	1.85		72.9	61	63	695	811	847	847	784	149	91
Range			7.9	3.7	2.7	3.3	.26		4.0	19	7	225	239	191	191	218	9	20

1/ Standard error (variety x method interaction) for a single determination = 24.0 cc.

Table 5.---(Concluded)

Average of Eastern and Western Composites

Variety or Cross	Nursery number	C. I. no.	Acres yield	Test weight	Protein content		Wheat		Flour	Water absorption	Baking method 1/				Average				
					content		Ash	Carotene content			Yield	Ash	and loaf volume				Wgt. of loaf	Grain and color	
					Wheat	Flour							No. 2	No. 3	No. 6	Opti-mum			Average
		(Bu.)	(Lbs.)	(Pct.)	(Pct.)	(Pct.)	(P.p.m.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Co.)	(Co.)	(Co.)	(Co.)	(Gms.)	(Score)		
Thatcher		10003	27.4	57.0	15.0	14.2	1.84	.56	2.47	71.9	.56	60	813	885	907	910	868	146	90
Hope x Thatcher 3	II-31-6	12043	28.6	57.5	16.1	15.7	1.97	.58	2.13	72.9	.58	62	761	898	922	922	860	147	89
Hope x Thatcher	II-36-15	12288	30.7	58.5	15.7	15.3	1.81	.55	2.19	72.0	.55	61	804	878	898	898	860	147	83
Comet-Pilot x Comet-1121	1689	12282	29.5	58.9	14.9	14.4	1.89	.53	2.24	72.4	.53	66	798	876	899	904	858	151	97
Hope x Thatcher	II-31-2	12199	30.7	58.5	15.2	14.5	1.80	.55	2.47	72.6	.55	63	760	883	915	915	853	147	92
Marquis 2 x H-44	RA-1333	12012	26.2	58.1	14.8	14.2	1.95	.57	2.30	71.4	.57	60	771	864	917	917	851	145	92
Comet x Pilot	1540-2	12274	30.6	59.2	15.2	14.8	1.82	.62	2.41	71.7	.62	63	788	861	893	893	847	148	88
Merit x Thatcher	1682	12203	29.5	57.2	14.9	14.4	1.73	.57	2.13	71.2	.57	64	761	866	905	907	844	150	94
Rival x Thatcher		12273	32.2	59.8	15.1	14.6	1.84	.63	1.90	74.4	.63	63	759	866	904	904	843	143	92
Rival x Thatcher	S.D.2280	12272	31.2	59.1	14.8	14.2	1.82	.61	1.85	74.7	.61	61	757	823	861	861	814	147	93
C.-D.C. x Mercury	S.D.2259	12193	33.9	60.7	14.8	14.1	1.86	.53	1.79	74.4	.53	63	753	835	850	854	813	148	97
Merit x Thatcher	Ms. 2849	12053	31.2	57.3	15.7	14.7	1.89	.66	2.41	73.0	.66	64	682	851	882	882	805	149	93
C.-D.C. x Mercury	1597	12270	30.3	58.2	15.1	14.4	2.00	.64	2.01	73.7	.64	66	732	832	849	849	804	152	93
Marquis	Ms.2794.19	3641	25.9	58.4	14.3	13.7	1.93	.66	2.30	72.5	.66	60	733	843	837	847	804	146	91
Merit x Pilot	---	12275	30.9	58.9	15.6	14.6	1.87	.64	2.19	73.4	.64	66	694	839	874	874	802	149	88
Comet-1121 x C.-H. x F.	1593	12093	31.7	59.3	14.4	13.2	1.78	.46	2.30	74.0	.46	60	737	811	836	836	795	146	89
Rel.-Hope x Comet-1121	1520	12050	31.6	59.1	14.8	13.9	1.87	.58	2.58	74.1	.58	60	726	794	844	844	788	147	87
Comet-Rel.-Hope x C.-H. x F.	1523	12047	31.0	60.0	14.6	13.4	1.93	.67	2.47	73.8	.67	60	712	822	829	829	788	147	92
Ill.-1-Hope x Webs.-Resaca	Ms.233	12265	35.4	58.5	14.4	13.0	1.79	.43	2.35	73.9	.43	60	692	812	856	856	787	149	81
Ceres-Komar-Hussar x Mercury	1651	12284	29.6	50.6	15.0	14.0	1.98	.51	2.19	74.3	.51	61	732	780	806	800	773	150	89
Mercury 2 x Comet-1018	Ms.2822	12071	29.9	57.9	14.9	14.0	1.73	.55	1.96	75.0	.55	64	682	770	819	819	760	152	88
Premier-40	Ms.2772.40	12271	31.0	59.2	14.8	13.8	1.99	.60	2.07	75.4	.60	62	692	770	815	815	759	150	90
C.-H.F. x Thatcher	II-36-18	12263	29.5	59.8	14.9	14.2	1.72	.59	2.02	75.4	.59	65	685	761	805	805	750	152	89
C.-H.F. x Thatcher	II-36-19	12287	31.6	59.6	14.5	13.6	1.75	.56	1.85	74.4	.56	63	673	750	788	788	737	149	90
C.-D.C. x Mercury	Ms.2989	12289	34.8	60.2	13.7	12.6	1.92	.62	1.96	74.5	.62	64	662	718	770	770	717	153	86
Hope x Turkey-Florence	1563	12195	29.8	57.1	13.6	13.0	1.88	.55	2.30	74.2	.55	60	614	679	719	719	671	150	79
Average			30.6	58.7	14.9	14.1	1.86	.58	2.19	73.5	.58	62	730	822	854	855	802	149	90
Range			9.5	3.7	2.5	3.1	.28	.20	.79	4.2	.20	6	199	219	203	203	198	7	18

1/ Standard error (variety x method interaction) for a single determination = 22.5 cc.

Table 6.--Yield, milling, baking and chemical results on hard red spring wheats grown in North Dakota and Montana Intra-State Nurseries, composited from stations indicated, 1942 crop

N. Dak. Intra-State Nursery

Fargo, Langdon, Mandan and Dickinson

Variety or Cross	Nursery number	C. I. no.	Acre yield	Test weight	Protein content		Wheat ash		Flour		Water absorption	Baking method and loaf volume			Average weight of loaf	Grain and crumb color	Texture
					Wheat	Flour	Wheat	ash	Yield	Ash		No. 2	No. 3	No. 6			
			(Bu.)	(Lbs.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Cc.)	(Cc.)	(Cc.)	(Grams)	(Score)	(Score)
Merit x Thatcher	1632	12280	32.1	60.4	14.9	13.6	1.81	70.7	.51	63	804	821	902	902	842	150	88
C.-D.C. x Mercury	Ns. 2848	12311	40.5	61.7	14.5	14.0	1.74	74.7	.51	60	781	826	847	847	818	147	98
Comet-Pilot x Comet-1121	1683		30.2	59.7	14.5	14.0	1.80	71.3	.54	62	735	829	888	888	817	150	87
Merit x Pilot	1764	12315	37.7	60.2	14.3	13.6	1.68	71.3	.53	65	809	801	838	838	816	152	93
Merit x Thatcher	1625	12279	34.3	60.0	14.1	13.5	1.75	72.5	.45	64	735	841	861	861	812	151	93
C.-D.C. x Mercury	Ns. 2794.44	12313	42.7	61.0	14.8	13.7	1.81	73.5	.55	64	789	798	841	841	809	151	95
C.-D.C. x Mercury	Ns. 2794.32		37.5	60.8	14.4	13.5	1.82	72.3	.50	62	807	798	806	807	804	149	97
Comet-1110 x H-44-Ceres	1586	12276	36.1	61.9	13.5	13.0	1.66	74.3	.48	60	778	809	821	821	803	148	90
Thatcher	(Check)	10003	27.7	59.8	14.1	13.3	1.79	72.2	.48	62	691	809	873	873	791	148	90
Pilot-13 x Ns. 2742	1750	12316	41.1	63.0	14.2	13.3	1.73	72.1	.49	63	789	795	778	795	787	150	90
C.-D.C. x Mercury	Ns. 2799		37.0	59.0	14.7	13.9	1.77	73.3	.58	62	746	787	823	823	785	149	90
Merit x Komar-Hussar-Ceres	1635		33.0	61.1	13.7	12.8	1.77	73.1	.53	65	713	783	841	841	781	152	92
Rel.-1018 x Mercury	1639	12208	41.7	60.4	14.1	13.7	1.80	72.8	.46	63	737	801	804	804	781	151	88
Ceres x Pilot	1556	12263	38.4	61.7	14.7	14.4	1.81	71.9	.53	62	689	778	856	856	774	150	87
Ceres x Pilot	1552	12077	34.7	60.5	14.1	13.6	1.81	71.5	.50	62	703	783	829	829	772	150	85
Reliance-1018 x Mercury	1691	12204	34.7	58.2	13.5	12.0	1.72	73.8	.45	60	769	772	758	772	766	148	92
Ceres-Komar-Hussar ₂ x Mercury	1650		38.6	61.3	13.7	13.1	1.72	72.7	.51	60	703	787	798	798	763	148	87
C.-D.C. x Mercury	Ns. 3087		41.9	61.2	14.1	13.2	1.71	73.5	.54	66	758	767	764	767	763	153	92
Mercury 2 x Reliance-Hope	Ns. 3089		38.9	61.5	14.1	13.2	1.76	73.8	.52	62	734	746	804	804	761	151	87
Mercury 2 x H-44-Ceres	Ns. 3090		38.4	61.1	14.3	13.4	1.72	74.4	.59	62	749	740	792	792	760	151	82
C.-D.C. x Mercury	Ns. 3091		43.6	61.5	14.4	13.6	1.72	73.9	.53	64	737	761	783	783	760	151	87
C.-D.C. x Mercury	Ns. 2852		42.4	62.0	13.9	12.5	1.85	73.9	.50	60	761	743	775	775	749	148	93
Mercury x H-44-Ceres	Ns. 3088		35.4	61.0	14.2	13.6	1.72	74.1	.52	63	758	726	764	764	749	150	95
Rel.-Hope x Pilot-Renown	1674	12278	37.3	62.6	14.0	12.9	1.72	73.1	.41	60	729	732	747	747	736	148	93
Mercury x Komar-Hussar	1740		39.7	60.4	13.6	12.8	1.77	72.9	.43	60	611	660	727	727	666	150	87
Hope x Turkey-Florence	1611		37.3	61.0	12.9	12.3	1.73	74.8	.56	60	646	629	680	680	652	151	80
Average			37.4	50.9	14.1	13.3	1.76	73.0	.51	62	741	774	808	809	774	150	90
Range			15.9	4.8	2.0	2.1	.19	4.1	.18	6	198	212	222	222	190	6	18

1/ Standard error (variety x method interaction) for a single determination = 30.9 cc.

Table 6.--(Continued)

Moccasin and Havre, Mont.

Mont. Intra-State Nursery

Variety or Cross	Nursery number	C. I. no.	Acre yield	Test weight	Protein content		Flour		Water absorption	Baking method and loaf volume			Average weight of loaf	Grain and color texture
					Wheat	Flour	Wheat	Flour		No. 2	No. 3	No. 6		
			(Bu.)	(Lbs.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Cc.)	(Cc.)	(Cc.)	(Grams)	(Score)
Pilot	1098-13	11945	28.2	58.8	15.8	15.3	1.71	71.3	.53	883	905	925	904	93
Reward-Hope x Comet x Pilot	1526	12225	29.6	59.8	16.1	15.1	1.70	70.5	.53	821	893	922	879	92
Rel.-Hope x H-44-Ceres	1524	12200	28.1	61.1	15.7	14.5	1.71	73.1	.50	841	888	891	873	93
Comet x 1110	1468-2	11931	35.2	61.9	15.5	14.5	1.62	73.4	.54	798	876	925	865	92
Merit x Thatcher	1825		30.2	58.0	16.2	15.8	1.67	71.2	.54	772	856	925	851	95
Comet x Pilot	1585	12073	33.9	60.1	15.1	14.1	1.65	71.4	.47	853	826	856	845	88
Marquis	(Check)	3641	31.6	61.1	16.1	15.6	1.69	71.1	.51	795	838	885	839	93
Rel.-1018 x Mercury	1691	12204	27.6	56.2	15.2	14.2	1.62	72.3	.47	804	853	853	837	93
Rel.-Hope x Comet-1121	1450-6		27.6	60.2	16.0	14.8	1.66	73.1	.47	841	835	833	836	92
Comet-1110 x Pilot	1676		29.7	61.5	15.3	14.6	1.61	72.4	.51	823	838	844	835	92
Comet-1121 x C.H.F.	1675		28.1	50.6	14.7	14.0	1.62	72.9	.55	789	815	879	828	98
Comet-1018 x Mercury	1599	12205	30.4	58.0	15.4	14.9	1.65	72.7	.55	755	841	885	827	98
Thatcher	(Check)	10003	30.0	58.4	16.4	15.8	1.65	71.8	.53	798	820	862	827	97
Reliance x Reward	1820		34.2	56.4	16.2	15.9	1.69	72.1	.54	767	827	873	822	88
Comet-1110 x H-44-Ceres	1538	12259	31.7	58.6	15.3	14.8	1.66	72.3	.46	798	821	847	822	97
Merit x Thatcher	1822		31.5	58.6	15.2	14.3	1.66	71.3	.52	770	821	838	810	93
Pilot-13 x Ms.2742	1678		28.6	61.9	14.9	14.5	1.62	72.3	.56	801	798	832	810	93
Ns.2742 x H.1530	1680		27.3	59.5	15.6	14.9	1.67	70.9	.55	746	799	844	796	95
Comet-1110 x H-44-Ceres	1673	12207	28.6	60.4	14.9	14.2	1.55	73.3	.57	721	798	859	794	88
Comet x Reliance	32-21-8		32.8	61.5	15.3	14.6	1.59	73.9	.54	770	780	832	794	90
Ceres	(Check)		29.1	60.7	16.0	15.3	1.71	72.1	.55	775	767	835	792	93
Comet-1121 x Merit	1677		27.9	59.3	16.2	15.3	1.73	70.8	.59	732	786	844	787	88
Comet (H-77)	649-77	11465	33.2	61.0	14.9	14.3	1.51	72.4	.43	735	767	832	778	97
Comet x 1018	1315	12060	34.5	59.7	14.8	14.3	1.49	70.6	.50	766	749	809	775	95
Merit x Pilot	1792		32.8	59.2	16.1	15.5	1.73	71.8	.58	712	761	838	771	88
Rel.-Reward x H-44-Ceres	1824		30.3	62.0	15.9	15.4	1.71	71.8	.57	715	767	821	768	88
Rel.-Hope x H-44-Ceres	1821		29.2	60.3	15.8	15.2	1.74	72.4	.54	715	738	844	763	87
H-44-Ceres-Marquis x Mercury	1670		30.5	60.0	15.0	14.6	1.55	72.8	.53	713	744	775	744	88
Rel.Hope x Comet-1121	1823		30.2	61.1	15.8	15.1	1.80	72.6	.54	660	691	689	680	83
Average			30.4	59.9	15.6	14.9	1.65	72.1	.53	775	810	852	812	92
Range			7.9	5.8	1.7	1.9	.29	3.4	.16	223	214	236	224	15

1/ Standard error (variety x method interaction) for a single determination = 24.7 cc.

Table 7.--Yield, milling, baking and chemical results on hard red spring wheats grown in the station nurseries at Mandan, Langdon, Dickinson, and Bozeman in 1942

Mandan, N. Dak.

Variety or Cross	Nursery number	C. I. no.	Acre yield	Test weight	Protein content		Wheat ash	Flour		Water absorption	Baking method 1/				Average		
					Wheat	Flour		Yield	Ash		Carot-enoid content	and loaf volume		Opti-mum	Weight of loaf	Crumb color	
												No.2	No.3				No.6
			(Bu.)	(Lbs.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(P.p.m.)	(Pct.)	(Cc.)	(Cc.)	(Cc.)	(Cc.)	(Grams)	(Score)	
Pilot	1098-13	11945	26.1	59.5	13.5	12.5	1.79	71.7	.57	1.68	60	801	792	823	805	146	92
Ns.2742 x N.1574	1760	12322	21.8	62.6	15.0	14.0	----	71.8	.54	2.01	65	763	818	826	802	147	82
Merit x Thatcher	1763		23.7	60.1	14.2	12.9	1.70	71.0	.55	1.68	62	735	795	844	791	148	87
Ns.2742 x N.1574	1759		23.9	60.7	14.6	14.0	----	70.4	.58	1.79	60	767	804	792	804	147	77
N.1511 x Merit	1707		19.4	60.5	14.3	13.4	1.71	71.2	.50	1.56	60	725	792	798	772	148	83
Merit x Thatcher	1700		21.5	59.1	13.5	12.3	1.85	72.9	.56	1.45	65	741	786	767	786	151	83
H-44-Ceros x Marquis-Mercury	1654		24.3	59.8	13.0	12.2	1.83	72.4	.58	1.56	63	729	781	766	781	149	83
Pilot 13 x Ns.2742	1756	12304	26.6	62.0	13.5	12.4	1.81	73.1	.50	1.34	60	743	766	740	766	146	85
Rel.-Hope x H-44-Ceros	1705	12320	28.9	60.6	12.8	11.7	1.84	73.0	.66	1.90	62	712	747	770	743	148	77
Comet-1121 x C.-H.xf.	1675		29.4	60.0	11.8	10.5	1.64	72.5	.50	1.68	62	697	743	746	729	148	82
Comet-1110 x H-44-Ceros	1673	12207	21.4	60.7	12.9	12.0	1.76	71.0	.61	2.47	60	629	727	704	734	149	70
Merit x Thatcher	1755		21.8	60.6	13.6	12.7	1.80	71.1	.53	1.34	60	752	680	706	752	148	77
Rel.-Hope x H-44-Ceros	1715	12201	25.5	61.8	13.7	12.3	1.79	71.5	.57	1.90	63	691	697	724	724	150	77
Ns.2742 x N.1529	1757		23.7	60.2	13.0	12.3	----	71.3	.55	1.90	60	649	704	712	680	148	77
N.1441 x N.1508	1695		25.2	61.5	12.9	11.6	1.81	71.3	.46	1.90	60	688	679	657	636	147	77
Average			24.2	60.7	13.5	12.5	1.78	72.0	.55	1.74	61	721	754	764	747	148	81
Range			10.0	3.5	3.2	3.5	.21	3.6	.13	1.13	5	172	146	187	156	5	22

1/ Standard error (variety x method interaction) for a single determination = 24.1 cc.

Table 7.---(Continued)

Langdon, N. Dek.

Variety or Cross	Nursery number	C.I. no.	Acre yield	Test weight	Protein content		Wheat ash	Flour		Water absorption Average	Baking method 1/ and Loaf volume				Average		
					Wheat	Flour		Yield	Ash		No. 2	No. 3	No. 6	Optimum	Weight of loaf	Crumb and color texture	
(Bu.)	(Lbs.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Cc.)	(Cc.)	(Cc.)	(Cc.)	(Grams)	(Score)	(Score)	
N.1449 x Pilot-13	1768	12323	27.8	61.0	15.7	15.0	1.64	72.9	.48	63	752	965	1021	1021	913	149	88
Comet-1110 x H-44-Cores	1586-2	12276	27.2	61.6	15.9	15.0	1.63	73.3	.48	62	783	894	919	919	865	148	90
Ms.2742 x N.1530	1777		23.2	55.8	15.5	14.8	1.45	73.3	.54	62	724	900	928	928	851	149	85
Pilot-13 x Ms.2742	1775		30.6	60.4	16.6	15.9	1.67	73.9	.52	62	719	879	940	940	846	149	87
Pilot (Check)		11945	25.1	59.3	15.4	14.4	1.74	71.2	.52	60	752	896	888	896	845	148	90
Pilot-13 x Ms.2742	1769	12324	33.3	61.1	15.5	14.8	1.61	74.7	.51	60	703	885	928	928	839	149	85
Pilot-13 x Merit	1774		24.4	56.5	15.9	15.3	1.66	71.7	.57	58	709	859	942	942	837	152	82
N.1511 x N.1441	1766		24.7	60.6	15.4	14.8	1.59	72.1	.50	55	735	868	905	905	836	151	85
N.1441 x Renown	1770		28.1	61.5	15.7	14.6	1.77	74.1	.49	62	755	832	914	914	834	149	85
C.-D.C. x Mercury	2829	12008	35.3	61.8	17.1	15.8	1.72	73.6	.51	62	716	832	899	899	816	149	93
Pilot-28 x Ms.2741	1767		31.4	50.0	15.6	14.6	1.79	74.7	.65	63	580	835	917	917	811	151	82
Pilot-13 x Ms.2742	1678		27.8	60.3	13.4	14.9	1.67	74.9	.52	60	706	853	859	859	806	148	88
Pilot-13 x Ms.2742	1776		28.5	59.7	15.3	14.5	1.76	75.0	.53	60	674	815	882	882	790	148	82
Pilot-13 x Ms.2742	1773		31.7	60.3	16.1	15.6	1.52	73.8	.48	60	688	798	850	850	779	149	87
Merit x Pilot	1765		22.5	57.0	16.6	15.9	1.66	70.7	.60	65	663	801	856	856	773	153	82
Ms.2742 x N.1529	1679		30.5	60.8	16.8	15.5	1.69	72.1	.46	60	691	775	798	798	755	150	83
Average			28.5	59.9	15.8	15.1	1.66	73.3	.52	62	716	855	903	903	825	150	86
Range			13.8	5.1	3.7	1.5	0.34	4.3	.19	06	120	190	223	223	158	5	11

1/ Standard error (variety x method interaction) for a single determination = 26.0 cc.

Table 7.---(Continued)

Dickinson, N. Dak.

Variety or Cross	Nursery number	C. I. no.	Acre yield	Test weight	Protein content		Wheat ash	Flour		Water absorption	Baking method and loaf volume			Average					
					Wheat	Flour		Yield	Ash		Carot- enoid content	No. 2	No. 3	No. 6	Opti- mum	Aver- age	Wgt. of loaf	Crumb color	Average
(Bu.) (Lbs.) (Pct.) (Pct.) (Pct.) (P.p.m.) (Pct.) (Cc.) (Cc.) (Cc.) (Grams) (Score) (Score)																			
H-44 x Ceres-Komar-Ridit	1613	12305	41.0	62.6	14.0	13.7	1.54	69.9	.45	1.72	60	749	815	835	835	800	148	90	87
Ceres x Pilot-Hussar-Hopo-Reliance	1535	33.7	60.3	13.2	12.3	13.2	1.60	72.7	.52	2.13	62	752	786	803	803	780	150	73	87
Hopo-Ridit-Reward x Komar	1742	42.1	61.4	14.9	13.6	14.9	1.49	72.5	.45	1.56	63	715	792	803	803	770	150	90	88
Ceres-Komar-Hussar-Mercury	1726	38.2	61.5	14.9	13.3	14.9	1.49	72.9	.50	1.68	64	683	769	809	809	754	152	83	83
Ceres x Hopo-Ridit	1534	12039	40.1	62.6	13.8	12.8	1.48	69.9	.47	1.68	66	743	724	775	775	747	152	78	85
Komar-Hussar x Hopo-Ridit-Reward	1735	36.5	62.5	14.1	13.1	14.1	1.61	72.2	.45	1.45	62	718	752	769	769	746	149	87	85
Conet x Pilot	1643	38.1	61.5	12.9	11.8	12.9	1.49	70.0	.42	2.24	60	735	740	724	740	733	149	72	82
Mercury x Komar-Hussar	1736	39.8	62.7	14.3	13.0	14.3	1.45	71.8	.41	1.56	64	686	741	755	755	727	151	85	85
Comot x M.1121	1609	41.9	61.3	11.7	11.3	11.7	1.44	73.7	.42	1.79	60	712	726	721	726	720	149	87	87
Mercury x H-44-Ceres-Komar-Ridit	1728	37.2	61.9	12.7	11.8	12.7	1.48	69.1	.43	2.69	62	675	719	735	735	710	150	70	83
Thatcher	(Check)	10003	36.2	62.3	13.3	12.9	1.55	69.6	.55	1.56	63	683	721	715	721	706	150	82	83
Hopo-Ridit-Bel. x1018-Reliance	1733	41.4	60.4	13.3	12.1	13.3	1.60	69.9	.47	2.47	62	649	716	746	746	704	151	70	82
Mercury x Komar-Hussar	1739	37.1	61.3	13.7	12.4	13.7	1.50	73.2	.44	1.68	62	617	735	755	755	702	150	83	85
Mercury x Komar-Hussar	1649	37.7	61.9	13.5	12.3	13.5	1.53	69.6	.49	1.79	63	611	694	752	752	686	153	87	83
Hopé x Turkey-Florence	1563	44.3	61.6	12.7	11.9	12.7	1.51	71.3	.47	1.56	60	593	717	746	746	685	150	83	80
Hope x Turkey-Florence	1745	44.2	61.1	12.7	12.3	12.7	1.37	72.5	.42	1.56	60	599	688	688	688	658	151	77	77
Average		39.7	61.7	13.4	12.6	13.4	1.51	71.3	.47	1.82	62	683	740	758	760	727	150	81	84
Range		13.4	2.4	2.2	2.5	2.2	.24	4.3	.13	1.24	6	159	127	147	147	142	5	20	11

1/ Standard error (variety x method interaction) for a single determination = 16.0 cc.

Table 7.--(Concluded)

- Table 26 -

Bozenan, Mont.

Variety or Cross	Hybrid number	Nursery number	Acre yield	Test weight	Protein content		Wheat ash	Flour			Water absorption	Baking method and loaf volume 1/			Average Wgt. of loaf of bread texture				
					Wheat	Flour		Yield	Ash	Carot-enoid content		No. 2	No. 3	No. 6		Opti-mum			
(Bu.)	(Lbs.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(P.p.m.)	(Cc.)	(Cc.)	(Cc.)	(Cc.)	(Cc.)	(Gns.)					
Rel.-Hope x Pilot	1105 A-IV-25	1872	39.1	60.3	12.5	11.5	1.70	70.7	.55	1.22	60	749	697	724	749	723	148	85	90
Rel.-Hope x Conet 1121	1251 A-1-6-3-1-3-1	1594-3-1	37.6	60.6	12.1	11.2	1.73	72.1	.53	1.79	60	715	703	741	741	720	149	88	90
Rel.-Hope x Conet 1121	1251 A-1-21-5-2-1	1520-1	45.2	60.8	12.4	11.4	1.67	70.6	.47	1.79	60	755	672	709	755	712	148	88	87
Conet-1110 x Pilot	1189 A-1-12-1-5	1718	38.5	61.2	11.5	10.5	1.66	73.6	.54	1.90	60	697	688	686	697	690	149	83	90
Rel.-Hope x H-44-Ceres	1254 A-1-4-4-1-2		42.4	60.5	12.2	11.5	1.69	71.5	.51	1.68	60	694	663	682	694	680	150	83	85
Thatcher	(Check)		50.0	60.6	13.0	12.0	1.57	68.5	.48	2.13	60	686	666	683	686	678	149	87	82
Rel.-Hope x H-44-Ceres	1254 A-1-4-24-1-3		39.4	60.7	12.8	11.8	1.74	72.4	.68	1.90	60	691	641	700	700	677	149	73	82
M. 1511 x M. 1441	1327 A-1-15-2-2	1719	35.1	61.5	13.2	11.0	1.71	70.7	.55	2.13	62	649	666	672	672	662	150	82	85
Morit x Thatcher	1290 A-1-7-3		40.7	60.0	12.8	12.1	1.70	71.4	.69	1.79	62	680	672	652	672	661	149	85	83
Rel.-Hope x Conet-1121	1251 A-1-20-8-2		45.1	61.7	12.4	11.2	1.63	71.2	.44	1.68	60	655	654	663	663	657	149	88	85
Rel.-Hope x Conet-1121	1251 A-1-35-1	1614	37.8	61.7	12.5	11.6	1.70	71.5	.49	2.13	60	632	646	663	663	647	148	85	83
1131-Pilot x Konar-Ceres	1298 A-1-5-1-1		35.7	61.2	11.9	10.7	1.75	71.8	.54	1.68	60	643	638	629	643	637	149	83	85
Rel.-Roward x H-44-Ceres	1251 A-1-16-1-3		35.7	61.1	11.5	10.9	1.71	69.6	.61	1.90	62	635	614	643	643	631	150	80	90
Conet-1121 x H-44-Ceres	1222 A-1-10-1-2-1	1573-1	39.2	60.5	12.3	11.3	1.84	72.3	.59	1.68	60	590	605	614	614	603	150	77	77
Conet-1110 x H-44-Ceres	1188 A-1-5-2-2		48.5	61.2	11.5	10.5	1.52	72.2	.57	1.79	62	581	581	599	599	587	151	80	78
Average			40.6	60.9	12.2	11.3	1.69	71.3	.55	1.81	61	669	654	671	679	664	149	83	84
Range			14.9	1.7	1.5	1.6	.32	.51	.25	.91	2	174	122	142	156	136	3	15	13

1/ Standard error (variety x method interaction) for a single determination = 16.7 cc.

BROMATE RESPONSE METHODS

The response to varying amounts of potassium bromate (0 to 3 milligrams per 100 grams of flour) is shown in table 8. Samples of 4/^{hard red}spring wheats and 4/^{hard red}winter wheats were obtained from Sheridan, Wyo., where they were grown on similarly prepared fallow, to determine if comparable high protein spring wheats would respond to increasing amounts of bromate as has been found for the winter wheats tested in the Hard Winter Wheat Quality Laboratory. The results shown in table 8 indicate that the spring and winter wheats respond alike producing the largest loaf volumes when 2 milligrams of bromate are used. These results show a higher bromate requirement for the spring wheat as compared with the 1940 and 1941 crop, where on the average 1 milligram of bromate produced the largest loaf volume. There was less difference in the bromate requirement of the/^{hard red}winter and/^{hard red}spring wheats than in the 1941 crop but it should be pointed out that the 1942 hard winter wheats averaged nearly 2 percent lower in protein content than the spring wheat, whereas in 1941 they were about equal in protein content.

U. S. D. A., MINNESOTA, AND NORTH DAKOTA METHODS

The same composite flours of the eight uniform varieties were baked a third year by the methods used by the Minnesota and North Dakota laboratories. Portions of the flours were also sent to each of these laboratories for similar tests. The results from the U. S. D. A. laboratory using the Minnesota and North Dakota methods are shown in table 9.

The results from the Minnesota methods show that the 2-hour fermentation and 2-minute mix generally gave the optimum volumes. Some of the varieties showed optimum volumes for the 3-hour fermentation and the 2-minute mix. The volumes are all significantly less than the No. 2 bake of the regular U. S. D. A. methods. As pointed out in the last year's report, the lower loaf volumes are due in part to scaling the dough to a uniform weight of 150 grams for all varieties. The Eastern Composite samples baked by the Minnesota methods averaged higher than the Western Composite samples in loaf volume, crumb color, grain and texture. The protein of the two composites was approximately the same.

The results from the single North Dakota malt-phosphate-bromate method shown in table 9 are given in duplicate for loaf volumes as the loaves were baked on different days. The average volumes are larger than those of the best Minnesota method but smaller than the No. 3 and No. 6 methods of the U. S. D. A., laboratory.

Table 8.--Yield, milling, baking, and chemical results on 4 spring wheats and 4 winter wheats, baked by methods to show bromate response on the two classes of wheat, grown on comparable fallow land at Sheridan, Wyo., in 1941-1942

Variety or Cross	C. I. number	Acres yield	Test weight	Protein content		Wheat ash	Flour		Water absorp- tion Aver- age	Mix- ing time	Milligrams of bromate and volume of loaf				Aver- age weight of loaf	Aver- age crumb color	Average grain and texture		
				Wheat	Flour		Yield	Ash			0	1	2	3					
				(Bu.)	(Lbs.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Min.)	(Cc.)	(Cc.)	(Cc.)	(Cc.)	(Cc.)	(Grams)	(Score)	(Score)	
				Hard Red Spring															
Pilot	11945	24.4	55.0	18.5	17.3	1.69	71.7	.49	64.0	2.0	810	1053	1151	977	1151	993	147	86	74
Thatcher	10003	22.9	57.0	19.1	17.8	1.63	70.8	.50	66.0	2.0	735	1036	1083	980	1083	959	148	81	74
Ceres	6900	25.7	53.1	19.3	17.9	1.69	70.5	.52	66.0	2.0	738	962	1073	936	1073	940	143	85	76
Rival	11706	22.3	57.1	17.2	16.0	1.58	71.1	.53	66.0	2.0	747	939	1015	922	1051	906	150	89	79
Average		23.9	56.8	18.5	17.3	1.66	71.0	.51	65.5	2.0	753	993	1081	966	1090	953	143	85	76
Range		3.1	3.1	2.1	1.9	0.11	1.2	.04	2.0	0	75	114	100	64	100	83	3	8	5
1/ Standard error (variety x method interaction) for a single determination = 12.5 cc.																			
Hard Red Winter																			
Manurita	6155	35.8	56.7	17.0	15.8	1.78	65.4	.45	60.0	2.0	932	906	983	986	986	952	145	70	76
Nobred	10094	41.6	56.0	16.2	15.2	1.48	67.1	.48	64.0	2.5	744	882	966	859	966	863	149	70	70
Karmont	6700	41.6	56.4	16.2	15.4	1.90	66.4	.53	65.0	2.0	635	752	809	795	809	743	151	73	75
Karred	5146	43.7	58.1	13.4	12.4	1.69	71.1	.56	64.0	2.0	606	712	717	700	717	684	152	73	74
Average		40.7	56.8	15.7	14.7	1.71	67.5	.52	63.3	2.1	729	814	869	835	870	812	149	73	73
Range		7.9	2.1	3.6	3.4	0.42	5.7	.13	5.0	.5	326	196	236	286	269	230	7	8	4

1/ Standard error (variety x method interaction) for a single determination = 39.5 cc.

Table 9.--Baking results from Minnesota and North Dakota and U. S. Dept. of Agriculture Laboratory methods for the Eastern and Western Composites and their averages of the uniform varieties grown in plot experiments in 1942

Minn. Method

Composite and Variety	2-hour fermentation		3-hour fermentation		Optimum volume	Average volume	Average		
	2-min. mix	4-min. mix	2-min. mix	4-min. mix			Weight of loaf	Crumbs color	Grain and texture
	(Cc)	(Cc)	(Cc)	(Cc)	(Cc)	(Cc)	(Grams)	(Score)	(Score)
<u>Eastern Composite</u>									
Regent	767	729	732	649	767	719	122	84	75
Renown	789	692	704	612	789	699	122	81	75
Hope x Thatcher ³	769	706	695	592	769	691	122	80	75
Merit x Thatcher	684	696	720	637	720	684	122	90	75
Thatcher	738	720	706	542	738	677	121	81	79
Pilot	726	663	677	592	726	665	122	84	75
Rival	690	690	671	598	690	662	122	85	75
Marquis	660	674	677	564	677	644	123	85	76
Average	728	696	698	598	735	680	122	84	76
Range	129	66	61	107	112	75	3	9	4
<u>Western Composite</u>									
Pilot	707	609	645	527	707	622	124	84	75
Rival	649	620	621	570	649	615	124	84	75
Renown	666	553	644	533	666	599	124	78	75
Regent	615	588	637	527	637	595	124	84	73
Marquis	618	545	629	556	629	587	124	83	76
Merit x Thatcher	596	553	621	530	621	576	123	84	71
Thatcher	640	542	579	472	640	549	124	75	70
Ceres	601	524	564	498	601	547	124	78	70
Average	637	567	618	527	644	586	124	81	73
Range	101	96	81	98	106	75	1	9	6
<u>Average of Eastern and Western Composites</u>									
Regent	691	659	685	588	702	657	123	84	74
Renown	728	623	674	573	728	649	123	80	75
Pilot	717	636	661	560	717	644	123	84	75
Rival	670	655	646	583	670	639	123	85	75
Merit x Thatcher	640	627	671	584	671	630	123	87	73
Marquis	639	610	653	560	653	616	124	84	76
Thatcher	689	631	643	507	689	613	123	78	75
Average	682	634	662	565	690	635	123	83	75
Range	89	45	42	81	75	44	1	9	3

Table 9.—(Continued)

N. Dak. Method (Malt-Phosphate-Bromate)

Composite and Variety	Replication		Average loaf volume	Average		
	1	2		Weight of loaf	Crumb color	Grain and texture
	(Cc.)	(Cc.)	(Cc.)	(Grams)	(Score)	(Score)
<u>Eastern Composite</u>						
Regent	956	905	931	133	85	70
Merit x Thatcher	910	916	913	140	90	75
Renown	905	876	891	133	80	70
Hope x Thatcher ³	853	853	853	135	80	70
Rival	865	836	851	139	90	75
Thatcher	783	824	804	136	80	75
Pilot	800	783	792	136	90	75
Marquis	783	778	781	136	75	75
Average	857	846	852	136	84	73
Range	173	138	150	7	15	5
<u>Western Composite</u>						
Merit x Thatcher	836	824	830	136	95	75
Rival	795	783	789	138	85	75
Regent	772	789	781	134	85	75
Renown	766	789	778	135	80	70
Pilot	778	726	752	135	80	70
Marquis	738	738	738	137	90	75
Thatcher	720	714	717	135	85	75
Ceres	686	680	683	140	75	70
Average	761	755	758	136	84	73
Range	150	144	147	6	20	5
<u>Average of Eastern and Western Composites</u>						
Merit x Thatcher	873	870	872	138	93	75
Regent	864	847	856	134	85	73
Renown	836	833	835	134	80	70
Rival	830	810	820	139	88	75
Pilot	789	755	772	136	85	73
Thatcher	752	769	761	136	83	75
Marquis	761	758	760	137	83	75
Average	815	806	811	136	85	74
Range	121	115	112	5	13	5

Table 9.--(Concluded)

Average of U.S.D.A., Minn., and N. Dak., Methods

Composite and Variety	Volume of Loaf				Weight of Loaf				Crumb Color				Grain and Texture			
	U.S. D.A.	Minn.	N. Dak.	Aver- age	U.S. D.A.	Minn.	N. Dak.	Aver- age	U.S. D.A.	Minn.	N. Dak.	Aver- age	U.S. D.A.	Minn.	N. Dak.	Aver- age
Eastern Composite																
Regent	919	719	931	856	150	122	133	135	92	84	85	87	83	75	70	76
Merit x Thatcher	893	684	913	830	153	122	140	138	95	90	90	92	88	75	75	79
Renown	890	699	891	827	147	122	133	134	95	81	80	85	92	75	70	79
Hope x Thatcher	915	691	853	820	149	122	135	135	90	80	80	83	90	75	70	78
Thatcher	899	677	804	793	149	121	136	135	92	81	80	84	88	79	75	81
Rival	865	662	851	793	152	122	139	138	97	85	90	91	92	75	75	81
Pilot	904	665	792	787	149	122	136	136	97	84	90	90	90	75	75	80
Marquis	822	644	781	749	151	123	136	137	97	85	75	86	88	76	75	80
Average	888	680	852	807	150	122	136	136	94	84	84	87	89	76	73	79
Range	97	75	150	107	6	3	7	4	7	9	15	9	9	4	5	5
Western Composite																
Pilot	886	622	752	753	147	124	135	135	93	84	80	86	88	75	70	78
Rival	809	615	789	738	149	124	138	137	95	84	85	88	83	75	75	79
Merit x Thatcher	772	576	830	726	151	123	136	137	92	84	95	90	87	71	75	78
Regent	795	595	781	724	149	124	134	136	92	84	85	87	90	73	75	79
Renown	787	599	778	721	149	124	135	136	93	78	80	84	86	75	70	78
Marquis	811	587	738	712	149	124	137	137	95	83	90	89	93	76	75	81
Thatcher	814	549	717	693	147	124	135	135	92	75	85	84	90	70	75	78
Ceres	809	547	683	680	150	124	140	138	95	78	75	83	90	70	70	77
Average	810	586	758	718	149	124	136	136	93	81	84	86	89	73	73	79
Range	114	75	147	73	4	1	6	3	3	9	20	7	6	6	5	4
Average of Eastern and Western Composites																
Regent	857	657	856	790	150	123	134	136	92	84	85	87	87	74	73	78
Merit x Thatcher	833	630	872	778	152	123	138	138	94	87	93	91	88	73	75	79
Renown	838	649	835	774	148	123	134	135	94	80	80	85	90	75	70	78
Pilot	895	644	772	770	148	123	136	136	95	84	85	88	89	75	73	79
Rival	837	639	820	765	151	123	139	138	96	85	88	90	90	75	75	80
Thatcher	857	613	761	744	148	125	136	136	92	78	83	84	89	75	75	80
Marquis	817	616	760	731	150	124	137	137	96	84	83	88	91	76	75	81
Average	848	635	811	765	150	123	136	136	94	83	85	87	89	75	74	79
Range	78	44	112	59	4	1	5	3	4	9	13	7	4	3	5	3

The average volumes for the different laboratory methods are shown in table 9. The varieties are arranged in descending order of the average loaf volume of the Minn., N. Dak., and U. S. D. A. methods. In the Eastern composite Regent, Merit x Thatcher, Renown, and Hope x Thatcher ³, had larger average volumes than Thatcher. In the Western composite Pilot was highest followed by Rival, Merit x Thatcher, Regent, Renown, and Marquis, with all the varieties better than Thatcher.

COMMERCIAL GRADE SAMPLES

As in past years a number of commercially grown wheat samples were obtained through the Food Distribution Administration for comparison with the varieties and strains produced in experimental plots. Seven such samples representing a number of grades and types, were obtained at Minneapolis, Minn., and Great Falls, Mont. The samples were composited by grade from cars of wheat grading No. 3 or better and represent the better grades of hard red spring wheats received at these markets. The quality results are given in table 10.

These samples average lower in protein content than the experimental plots and nursery samples. Otherwise the milling, baking, and chemical results do not appear to be greatly different, especially when based on samples having approximately the same test weight and protein content.

COMPARABLE SAMPLES WITH THATCHER: 1942

In table 11, the properties of the 1942 samples of 14 varieties or strains of hard red spring wheat are compared with those of Thatcher wheat. The varieties are arranged in order of their average loaf volumes for the 3 baking methods. The results are in general agreement with the 5-year averages.

COMPARABLE SAMPLES, 1938 to 1942

Table 12 gives the 5-year averages of the milling, baking and chemical properties of 15 varieties and strains, together with the averages of comparable samples of Thatcher. These include the leading commercial varieties grown in the region and the most promising new hybrid strains that have been tested over a period of years. From 13 to 71 comparisons were made for these wheats. The more important quality comparisons shown in the summary table 12 will be discussed in relation to Thatcher as 100 percent.

Table 10.--Milling, baking, and chemical results on 7 composite samples of commercial hard red spring wheat grades obtained at Minneapolis, Minn., and Great Falls, Mont., representing the 1942 crop

Location where obtained	Samples composited from car lots	U. S. Grade	Test weight	Protein content		Flour		Water absorp- tion Aver- age	Baking method and Loaf volume 1/				Average			
				Wheat Flour	Wheat ash	Yield	Ash		No.2 No.3	No.6 Opti- mum	Aver- age	Weight of loaf	Crumb and color	Grain and texture		
			(Lbs.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Cc.)	(Cc.)	(Cc.)	(Cc.)	(Grams)	(Score)	(Score)	
Minneapolis, Minn.	62	1 Hyv.D.M.S.	60.9	13.4	12.8	1.62	72.1	.56	62	709	744	763	739	149	92	92
Do	219	1 D.M.S.	59.5	13.6	13.4	1.74	72.3	.59	60	720	758	775	751	149	92	93
Do	191	2 D.M.S.	58.5	13.6	13.0	1.75	72.2	.59	63	729	806	809	809	150	92	92
Do	143	3 D.M.S.	57.3	14.1	13.3	1.78	71.7	.55	60	795	827	845	822	149	92	92
Do	55	1 N.S.	59.5	12.4	11.7	1.65	72.1	.51	62	690	712	786	729	152	92	92
Great Falls, Mont.	318	1 Hyv.D.M.S.	60.9	15.0	13.9	1.55	72.2	.52	63	752	836	881	823	152	95	93
Do	242	1 D.M.S.	59.7	15.3	14.5	1.63	71.7	.52	63	732	842	899	824	150	92	93
Average			59.5	13.9	13.2	1.67	72.0	.55	62	732	789	808	808	150	92	92
Range			3.5	2.9	2.8	0.23	.6	.08	3	105	130	136	136	3	3	1

Table 11.--Average of the milling, baking and chemical properties of 15 wheats, the average of comparable samples of Thatcher, and of each variety in percentage of Thatcher, with the varieties arranged in order of percentage for average loaf volume, 1942

Variety or Cross	No. of samples	Test weight (lbs.)	Crude protein of wheat	Yield of flour (Pct.)	Ash in flour (Pct.)	Water absorption Aver.	Baking methods and volume of loaf				Crumb color 1/	Grain and texture 1/
							No. 2	No. 3	No. 6	Average		
3							(C.C.)	(C.C.)	(C.C.)	(C.C.)	(Score)	(Score)
Hope x Thatcher, 11-31-14	10	57.8	14.9	72.7	.53	61	799	857	920	865	86	88
Thatcher	10	57.6	14.9	71.3	.53	60	750	853	889	831	87	88
Percentage of Thatcher	10	101.6	106.4	101.3	100.0	101.6	106.5	106.5	103.4	103.2	98.3	100.0
Pilot	14	58.4	14.0	71.6	.51	60	801	857	885	891	91	89
Thatcher	14	57.5	14.2	69.9	.53	60	752	840	875	879	86	87
Percentage of Thatcher	14	101.8	98.6	99.9	98.2	100.0	106.5	103.0	101.1	101.4	103.8	102.3
Donovan	8	50.3	15.0	72.9	.50	61	765	885	918	855	91	90
Thatcher	8	52.8	14.4	72.8	.54	61	758	850	878	885	88	88
Percentage of Thatcher	10	104.3	104.2	101.2	92.6	100.0	100.9	101.1	104.6	103.7	102.9	102.3
Hope x Thatcher 3, 11-31-6	6	57.7	15.4	73.5	.57	62	818	887	934	934	92	92
Thatcher	6	56.6	14.1	71.6	.55	60	796	874	911	912	88	90
Percentage of Thatcher	101.9	109.2	102.7	103.6	103.6	103.3	102.8	101.5	102.5	102.4	104.5	102.2
Regent	9	58.9	15.7	71.7	.58	61	759	883	919	920	89	87
Thatcher	9	57.3	14.8	71.9	.52	60	761	860	897	892	86	87
Percentage of Thatcher	102.3	106.1	99.7	92.3	92.3	101.7	99.7	102.6	103.6	103.1	103.5	100.0
Ceres	9	58.5	15.1	70.5	.51	62	771	851	877	888	84	85
Thatcher	9	57.8	15.4	71.8	.53	61	731	839	875	881	84	84
Percentage of Thatcher	101.3	98.1	99.2	98.2	98.2	101.6	105.5	101.4	100.2	100.8	100.0	98.8
Rival	11	59.5	14.7	73.0	.53	63	752	862	895	895	91	89
Thatcher	11	58.9	14.6	72.1	.54	60	747	852	880	884	85	83
Percentage of Thatcher	103.8	106.9	101.2	98.1	98.1	103.0	100.7	101.7	101.2	101.0	103.8	101.1
Vesta	4	50.2	14.1	73.8	.51	60	751	802	849	844	93	91
Thatcher	4	50.1	14.1	71.3	.51	61	735	824	845	853	83	82
Percentage of Thatcher	103.6	100.0	103.2	100.0	100.0	98.4	102.2	97.3	99.4	98.9	112.0	104.6
C.D.C. x Mercury, Ms. 2829	7	58.4	14.8	73.2	.53	61	789	887	902	902	852	89
Thatcher	7	58.5	14.8	71.7	.53	60	788	886	917	919	86	86
Percentage of Thatcher	106.5	102.1	102.7	92.3	92.3	101.6	100.1	97.9	98.4	98.2	107.0	101.1
Merit x Thatcher, N. 1597	13	58.0	15.0	71.7	.55	64	720	846	883	883	91	88
Thatcher	13	57.0	14.9	71.7	.53	60	760	846	879	883	86	86
Percentage of Thatcher	101.0	104.9	100.0	100.0	100.0	100.7	94.7	100.0	100.5	100.0	105.8	101.1
Rel.-Hope x Comet-11-21, N. 1520	10	59.1	14.6	73.0	.50	60	759	825	856	857	87	86
Thatcher	10	57.3	14.6	71.6	.53	60	757	857	884	889	85	85
Percentage of Thatcher	103.1	106.8	102.8	91.3	91.3	100.0	99.0	98.4	98.3	97.1	102.4	99.7
Marquis	9	58.7	14.5	70.7	.54	60	735	830	848	856	91	88
Thatcher	9	57.4	15.1	71.6	.52	60	771	860	890	894	87	88
Percentage of Thatcher	102.3	96.0	98.7	103.8	103.8	100.0	95.3	96.5	95.7	95.6	104.6	100.0
Merit	4	57.3	14.4	73.3	.55	64	727	809	834	857	84	86
Thatcher	4	57.3	14.4	72.0	.53	61	773	846	856	874	83	87
Percentage of Thatcher	100.0	100.0	101.8	103.8	103.8	101.9	94.0	95.6	95.1	97.7	101.2	98.9
Mercury x Comet-1018, Ms. 2822	7	58.6	14.7	74.1	.51	63	722	825	869	869	88	90
Thatcher	7	58.9	14.2	71.8	.54	60	796	883	911	913	87	80
Percentage of Thatcher	103.2	103.5	103.8	92.4	92.4	103.0	90.7	93.4	95.1	95.3	101.1	100.0

1/ Average volume, color and texture for 4 methods of baking (nos. 1, 2, 3, and 6).

Table 12.--Annual and total number of samples comparable with Thatcher and averages expressed as a percentage of Thatcher for the 5 years, 1938 to 1942, inclusive

Variety or N. No.	Test weight						Variety or N. No.	Crude protein of wheat					
	1938	1939	1940	1941	1942	Average		1938	1939	1940	1941	1942	Average
Ns.2829	---	104.8	105.6	107.9	106.5	106.6	II-31-6	---	---	103.0	110.1	109.2	108.6
Renown	107.0	101.4	103.7	104.7	104.3	104.2	Regent	106.0	103.1	102.5	106.8	106.1	108.0
Vesta	104.5	101.9	103.9	103.4	103.6	103.4	II-31-14	---	---	101.2	108.2	106.4	106.5
N. No. 1520	---	100.3	103.7	104.6	103.1	103.4	N. No. 1597	---	---	100.0	104.8	104.9	104.5
Ns. 2822	---	---	102.5	103.4	103.2	103.2	Renown	98.7	100.6	102.6	103.9	104.2	103.1
Rival	105.1	100.7	100.2	103.6	102.6	102.5	Merit	---	111.9	98.8	103.4	100.7	102.7
II-31-6	---	---	100.0	102.7	101.9	101.9	Ns.2822	---	---	93.9	103.4	103.5	101.9
Ceres	102.1	102.5	98.4	103.2	101.3	101.4	Thatcher	100.0	100.0	100.0	100.0	100.0	100.0
Pilot	100.9	100.0	100.5	102.3	101.6	101.1	Ns.2829	---	97.6	95.6	102.0	102.1	99.7
Regent	101.5	97.0	98.6	102.7	102.3	100.9	N. No.1520	---	98.5	100.0	98.7	100.0	99.6
II-31-14	---	---	99.7	100.7	101.0	100.8	Pilot	102.0	94.2	100.0	100.7	98.6	99.0
N.No.1597	---	---	98.8	100.4	101.0	100.6	Rival	100.6	94.2	97.5	100.7	100.7	98.8
Thatcher	100.0	100.0	100.0	100.0	100.0	100.0	Vesta	100.0	94.7	100.0	100.7	100.0	98.8
Marquis	100.0	100.7	96.1	99.5	102.3	99.6	Ceres	98.6	95.7	97.4	97.5	98.1	97.6
Merit	---	96.0	99.1	99.1	100.0	99.3	Marquis	100.0	95.1	93.2	96.9	96.0	95.7

Variety or N. No.	Flour yield						Variety or N. No.	Ash of flour ^{1/}					
	1938	1939	1940	1941	1942	Aver.		1938	1939	1940	1941	1942	Aver.
Vesta	104.0	102.8	105.4	103.5	103.2	103.5	N.No.1520	---	131.2	107.7	107.5	106.0	108.0
Ns.2822	---	---	103.0	103.3	103.6	103.4	Ns.2822	---	---	102.1	98.0	105.9	101.6
Ns.2829	---	100.7	102.3	102.5	102.7	102.4	Ns.2829	---	114.5	100.0	94.1	103.3	101.0
Rival	105.5	102.7	99.4	103.1	101.2	102.3	Pilot	100.0	102.0	98.0	98.1	103.9	100.4
II-31-6	---	---	102.1	100.9	102.7	101.9	Ceres	102.0	96.2	101.9	96.2	103.9	100.2
N.No.1520	---	100.1	101.1	101.1	102.0	101.6	Thatcher	100.0	100.0	100.0	100.0	100.0	100.0
II-31-14	---	---	103.1	101.0	101.3	101.4	Vesta	100.0	97.9	96.0	95.8	100.0	98.4
Merit	---	99.2	102.1	100.9	101.8	101.2	Rival	103.9	96.0	92.5	94.2	101.9	97.5
Renown	101.1	99.9	101.0	101.7	101.0	101.2	Regent	96.0	88.7	84.6	96.2	108.3	96.1
Regent	100.9	98.4	100.0	100.9	99.7	100.1	II-31-14	---	---	73.9	92.3	100.0	94.4
Thatcher	100.0	100.0	100.0	100.0	100.0	100.0	Renown	98.0	93.9	100.0	96.2	108.0	94.2
N.No.1597	---	---	99.3	99.6	100.0	99.8	Marquis	100.0	98.1	92.5	90.6	96.3	94.2
Ceres	102.4	100.3	95.8	100.7	99.0	99.4	Merit	---	97.9	84.8	88.5	96.4	90.5
Pilot	98.5	99.3	98.2	99.4	99.9	99.1	II-31-6	---	---	76.1	88.7	96.5	90.4
Marquis	100.0	98.3	94.2	92.9	98.7	96.0	N.No.1597	---	---	76.1	86.5	94.6	90.4

^{1/} Reciprocal percentage values used.

Table 12.--(Continued)

Variety or N.number	Water absorption of flour						Variety or N.number	Loaf volume, Commercial method, No. 2					
	1938	1939	1940	1941	1942	Average		1938	1939	1940	1941	1942	Average
Merit	---	107.9	110.0	106.3	104.9	106.5	II-31-14	---	---	97.7	101.9	106.5	103.9
N.No.1597	---	---	109.2	104.8	106.7	106.2	Pilot	105.5	101.0	100.9	100.9	106.5	102.8
Ns.2822	---	---	104.5	101.6	105.0	103.3	II-31-6	---	---	97.5	101.2	102.8	101.3
Rival	103.9	100.5	102.2	103.2	105.0	103.0	Thatcher	100.0	100.0	100.0	100.0	100.0	100.0
II-31-6	---	---	105.4	101.6	103.3	103.0	Ceres	102.0	96.8	95.3	98.4	105.5	99.7
II-31-14	---	---	103.1	101.6	101.6	101.8	Renown	95.0	91.9	98.7	98.9	100.9	98.5
Ceres	102.9	97.7	101.5	103.2	101.6	101.8	Regent	93.7	96.6	98.5	98.1	99.7	98.2
Regent	100.7	99.1	100.5	101.6	101.6	101.0	N.No.1520	---	---	93.6	92.1	96.0	99.0
Vesta	101.0	99.8	100.0	101.6	98.4	100.4	Rival	101.0	95.5	93.3	95.2	100.7	97.1
Thatcher	100.0	100.0	100.0	100.0	100.0	100.0	N.No.1597	---	---	96.1	97.5	94.7	95.8
Renown	100.0	99.7	98.8	100.0	100.0	99.7	Vesta	96.0	91.5	95.0	96.3	102.2	95.9
Ns.2829	---	97.3	99.8	98.4	101.6	99.6	Marquis	98.6	97.8	93.0	96.7	95.3	95.6
Pilot	97.8	98.9	100.5	100.0	100.0	99.6	Ns.2829	---	96.1	91.9	92.7	100.1	94.5
N.No.1520	---	96.8	97.7	98.4	100.0	99.2	Merit	---	96.3	90.5	94.0	94.0	93.7
Marquis	100.0	94.8	97.1	100.0	100.0	98.6	Ns.2822	---	---	87.5	91.7	90.7	90.7

Variety or N.number	Loaf volume, Commercial method, No. 3						Variety or N.number	Loaf volume, Commercial-bromate malted wheat flour, method No. 6					
	1938	1939	1940	1941	1942	Average		1938	1939	1940	1941	1942	Average
Regent	100.6	98.9	100.9	105.1	102.6	102.4	II-31-14	---	---	99.1	104.7	103.4	103.4
Renown	97.5	95.1	100.7	101.4	104.1	101.1	Regent	109.8	100.1	99.9	105.0	103.6	103.2
II-31-14	---	---	98.9	101.1	100.4	100.5	Renown	93.9	98.8	100.4	102.5	104.6	101.7
N.No.1597	---	---	99.0	100.9	100.0	100.3	N.No.1597	---	---	97.9	102.2	100.5	100.9
Pilot	105.8	96.2	98.2	99.8	102.0	100.1	II-31-6	---	---	95.9	100.1	102.5	100.6
Thatcher	100.0	100.0	100.0	100.0	100.0	100.0	Thatcher	100.0	100.0	100.0	100.0	100.0	100.0
II-31-6	---	---	98.2	98.4	101.5	99.8	Merit	---	115.0	97.2	99.4	96.4	99.4
Merit	---	101.1	97.4	97.4	95.6	97.2	Pilot	97.3	95.8	98.0	99.6	101.1	98.7
Ceres	98.6	92.3	90.5	96.8	101.4	96.2	Rival	95.4	94.2	90.3	97.1	101.7	96.1
Rival	100.7	92.3	89.5	95.2	101.2	95.8	N.No.1520	---	93.0	91.9	96.9	96.8	96.0
Marquis	96.5	92.6	92.6	98.4	96.5	95.6	Ceres	95.6	91.9	89.9	99.1	100.2	95.9
N.No.1520	---	86.4	88.6	93.7	96.4	94.3	Vesta	97.0	87.2	94.2	95.4	99.4	94.5
Vesta	96.6	86.3	94.2	97.4	97.3	94.2	Marquis	94.2	90.9	90.0	99.3	95.3	94.5
Ns.2822	---	---	86.6	93.6	93.4	92.4	Ns.2822	---	---	90.9	94.6	95.4	94.3
Ns.2829	---	91.4	87.2	91.5	97.0	91.7	Ns.2829	---	87.7	88.8	91.5	98.4	92.1

Table 12.--(Concluded)

Variety or N.number	Loaf volume, Optimum						Variety or N.number	Loaf volume, Average for three methods					
	1938	1939	1940	1941	1942	Average		1938	1939	1940	1941	1942	Average
II-31-14	----	----	99.1	104.3	103.2	103.2	II-31-14	----	----	98.6	102.7	103.4	102.6
Regent	106.6	99.7	100.5	104.9	103.1	102.9	Regent	101.6	98.6	99.8	102.8	101.9	101.3
Renown	96.3	98.9	100.3	102.0	103.7	101.5	Renown	98.0	95.4	100.0	102.7	102.9	101.3
II-31-6	----	----	97.1	100.3	102.4	100.8	Pilot	102.7	97.3	99.0	100.1	103.0	100.4
N.No.1597	----	----	97.9	101.5	100.0	100.4	Thatcher	100.0	100.0	100.0	100.0	100.0	100.0
Thatcher	100.0	100.0	100.0	100.0	100.0	100.0	II-31-6	----	----	97.2	98.3	102.2	99.9
Pilot	99.3	96.0	98.5	100.0	101.4	99.2	N.No.1597	----	----	97.7	100.2	98.4	99.0
Merit	----	104.8	97.2	98.8	97.7	98.7	Ceres	98.7	97.2	95.4	98.1	101.8	98.3
Rival	97.3	93.9	92.1	96.6	101.2	96.4	Merit-3	----	104.2	95.1	96.9	95.4	96.8
Ceres	97.3	91.9	90.2	99.4	100.8	96.4	Rival	99.0	94.0	91.0	95.9	101.0	96.3
N.No.1520	----	86.4	92.3	96.8	96.4	95.4	N.No.1520	----	90.9	90.7	95.5	97.1	95.6
Marquis	94.3	90.9	91.9	98.8	95.7	94.9	Marquis	96.5	93.6	91.9	98.1	95.6	95.2
Vesta	96.2	87.3	94.2	97.5	98.9	94.6	Vesta	96.6	88.2	91.4	96.4	99.0	94.8
Ns.2822	----	----	89.9	94.6	95.3	94.1	Ns.2829	----	91.5	89.2	91.9	98.6	92.7
Ns.2829	----	88.4	89.0	91.4	98.2	92.1	Ns.2822	----	----	88.4	93.3	93.3	92.5
Variety or N.number	Crumb color, Average for all methods						Variety or N.number	Grain-texture, Average for all methods					
	1938	1939	1940	1941	1942	Average		1938	1939	1940	1941	1942	Average
Ns.2829	----	108.8	103.6	111.1	107.0	107.5	II-31-6	----	----	97.8	102.3	102.2	101.6
N.No.1597	----	----	101.1	111.1	105.8	107.4	N.No.1597	----	----	94.4	102.3	101.1	101.1
Vesta	112.3	96.4	103.6	103.5	112.0	106.1	Pilot	104.6	99.9	97.9	101.2	102.3	100.9
II-31-6	----	----	95.4	110.3	104.5	105.3	Renown	98.4	101.4	98.9	101.2	102.3	100.9
Ns.2822	----	----	104.5	106.2	101.1	104.1	Ns.2829	----	103.4	97.8	101.1	101.1	100.2
Pilot	109.5	101.7	100.1	103.6	105.8	103.7	Thatcher	100.0	100.0	100.0	100.0	100.0	100.0
Renown	98.2	98.8	101.2	103.6	105.8	102.9	Ns.2822	----	----	99.3	98.9	100.0	99.4
Rival	108.6	98.2	96.4	103.6	105.8	102.6	II-31-14	----	----	94.4	100.0	100.0	99.4
N.No.1520	----	95.9	100.0	103.7	102.4	102.0	Marquis	91.1	100.8	98.9	100.0	100.0	99.3
Marquis	92.6	104.2	100.0	100.0	104.6	101.4	Rival	99.3	99.0	94.3	101.2	101.1	99.2
Regent	97.5	95.7	97.7	103.7	103.5	100.9	Ceres	93.7	103.7	95.3	101.2	98.8	98.4
II-31-14	----	----	92.0	105.1	98.8	100.4	N.No.1520	----	97.1	101.1	98.9	97.7	98.3
Thatcher	100.0	100.0	100.0	100.0	100.0	100.0	Vesta	97.7	93.1	96.6	98.8	101.6	97.9
Merit-3	----	90.8	88.5	101.2	101.2	99.1	Regent	95.8	93.5	93.3	98.9	100.0	97.1
Ceres	95.3	100.0	95.2	100.0	100.0	98.2	Merit-3	----	86.9	89.9	97.7	98.9	96.4

Table 13.--The number of samples of each variety each year and the total for all years included on which the data of table 12 are based.

Variety or N. number	Number of samples					
	1938	1939	1940	1941	1942	Total
II-31-6	--	--	2	5	6	13
Renown	2	3	6	13	8	32
Ns.2829	--	2	9	10	7	28
Ns.2822	--	--	3	9	7	19
N.No.1597	--	--	2	10	16	28
N.No.1520	--	1	2	4	10	17
Pilot	8	11	14	13	14	60
Vesta	8	6	1	5	4	24
Regent	2	4	7	10	9	32
Rival	8	9	9	13	11	50
II-31-14	--	--	2	7	10	19
Thatcher	11	12	14	16	18	71
Ceres	4	3	6	7	6	26
Morit-3	--	1	2	10	4	17
Marquis	2	4	8	9	9	32

Thatcher

Thatcher was distributed for commercial growing in 1934. It has shown excellent milling and baking qualities in experimental baking tests and is preferred by the grain trade. As it is resistant to stem rust and yields well, it has been the most widely grown variety in the spring-wheat region since 1938. It is therefore used here as the standard (100 percent) of comparison for the different properties.

Pilot.

Pilot has been a uniform variety in plots since 1936 and commercially grown since 1939. It is resistant to leaf rust and mildew, and also equal or more resistant to stem rust and bunt than Thatcher. It has outyielded all of the varieties in uniform plots throughout the spring-wheat region during the past five years. As an average of sixty comparable samples Pilot exceeds Thatcher ^{with respect} to test weight, ash, loaf volume for methods no. 2, 3, and average, crumb color, and grain and texture. It averaged slightly lower than Thatcher for the other properties.

Rival

Rival has been in the uniform set of varieties in plots since 1938 and with Pilot was first distributed for commercial growing in the spring of 1939. The commercial acreage of Rival probably exceeded that of Pilot in 1942, together totaling about 2-1/2 million acres. Rival is more resistant to leaf rust and bunt than Thatcher but less resistant than Pilot. In all fifty comparable samples of Rival and Thatcher have been tested. On the average Rival has exceeded Thatcher ^{with respect} to test weight, flour yield, water absorption, and crumb color. It ranks tenth in average loaf volume.

Regent

Regent was distributed for commercial growing in Canada in the spring of 1939. It has been grown on a small scale in the United States since 1940. It was made a uniform variety in the regional plot tests in 1942. In general, it has yielded less than Pilot and Rival but more than Thatcher and other uniform varieties. During five years 32 comparable samples show Regent to exceed Thatcher ^{with respect} to crude protein, test weight, flour yield, water absorption, loaf volume for methods no. 3 and 6, and crumb color, among the 15 varieties for average loaf volume. It ranked second in average loaf volume.

Renown

The original Renown was distributed in Canada in 1937, and has been sparingly grown in the United States since 1938. A new, single-line strain was distributed in 1939. This strain has replaced the original in these tests and largely on farms and was made a uniform variety in plot tests for the region in 1939. It has not been a high yielding wheat although it is very resistant to both stem and leaf rust and to bunt. During the 5-year period 32 comparable samples show Renown to exceed Thatcher ^{with respect} to test weight, crude protein, flour yield, loaf volume for methods 3 and 6, crumb color, and grain and texture. It ranks third among the 15 varieties in average loaf volume.

Vesta

Vesta was distributed by the North Dakota station in 1942. Twenty-four comparable samples during the 5 years show Vesta to exceed Thatcher ^{with respect} to test weight, yield of Flour, water absorption, and crumb color. It averaged lower for the other properties and ranked 13th in average loaf volume.

N. No. 1597

Merit x Thatcher, N. No. 1597, was made a uniform variety in 1942. It ranked second for yield in the regional plot tests at 20 stations. It is a stiff-strawed, awnletted wheat resistant to both stem and leaf rust. It has been included in baking tests for three years totaling 28 comparable samples. On the average it exceeds Thatcher ^{with respect} to test weight, protein, water absorption, loaf volume for methods 3 and 6, crumb color, and grain and texture. Among the 15 wheats it ranked seventh in average loaf volume.

II-31-14

3
Hope x Thatcher, II-31-14 and II-31-6, are two of several back-cross strains developed at the Minnesota stations to transfer the leaf rust resistance of Hope to Thatcher. These and other similar strains have been composited and the resulting variety has been named Newthatch. This wheat is being increased with a view to distribution in 1944. Number II-31-14 was a uniform strain in the Eastern section in 1942 but has been replaced by Newthatch for that section in 1943. As an average of 19 comparable samples it exceeds Thatcher ^{with respect} to test weight, protein, flour yield, water absorption, loaf volume for methods no. 2, 3, and 6, and crumb color. It ranked first in average loaf volume.

The similar strain II-31-6 ranked sixth for average loaf volume. The composite of these and other similar strains for Newthatch should retain the high quality of these strains in a single variety.

Ns. 2829

Ceres-Double Cross (R.L.625) x Mercury, Ns. 2829, has been in plot experiments at N. Dak and Minn., stations for 3 years. It is a stiff-strawed, awned, rust-resistant wheat, with large kernels, which has yielded well in both nursery and plot tests. Based on 28 comparable samples grown for 4 years it exceeds Thatcher in test weight, flour protein, ash, crumb color, and grain and texture. It ranked fourteenth in average loaf volume but is among the best with respect to test weight, flour yield and crumb color.

N. No. 1520

Reliance-Hope x Comet-Reliance-Hope, N. No. 1520, is a high yielding, stiff-strawed, free threshing, short kernalled, rust-resistant wheat, advanced to plot experiments at 10 stations in 1942. It outyielded Pilot and all other uniform varieties at these stations in 1942. Milling and baking tests have been made with 17 comparable samples. These show that this variety exceeds Thatcher in test weight, flour yield, ash and crumb color. It ranked eleventh in average loaf volume.

Ns. 2822

Mercury² x Comet-N. No. 1018, Ns. 2822, is an awnleted, stiff-strawed wheat which has yielded well in nursery and plot experiments. It is not one of the uniform plot varieties. An average of 19 comparable samples for 3 years show that it exceeds Thatcher in test weight, protein, flour yield, ash, water absorption and crumb color. It ranked lowest of the 15 wheats in average loaf volume but has a heavy test weight, high flour yield, and low ash content.

Others

Of the many other strains tested for fewer years or for the first time in 1942, probably the most outstanding is ^{Regent x} Pilot-13 (N. No. 1753), one of the 1941-42 Mesa, Arizona, increases grown from late seeding in an increase plot at Langdon, N. Dak., in 1942. This strain exceeded all of the 22 other new wheats in the test for each of the three baking methods and also the Pilot check, exceeding it in optimum volume by 18 percent.
